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North Carolina Department of Transportation
Division of Highways
Statewide Planning Branch

THOROUGHFARE PLAN STUDY AND TECHNICAL REPORT FOR THE TOWN OF SILER CITY

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This report is dedicated to the memory of

Peter R. M. Slipp, M.S., P.E.

who lost a courageous battle with colon cancer while completing this study. His true loves were his wife, two sons, civil engineering, and the N.C. State Wolfpack. I am extremely honored and proud that he called me a friend.

GO AIRBORNE!

SILER CITY THOROUGHFARE PLAN TECHNICAL REPORT

AUGUST 1999

Prepared by:

North Carolina Department of Transportation
Division of Highways
Statewide Planning Branch

Raleigh, North Carolina

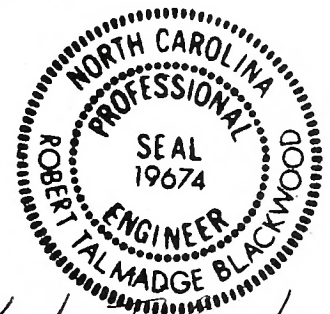
In cooperation with:

Town of Siler City

Federal Highway Administration

Produced by:

Statewide Planning Branch Manager:	M. R. Poole, Ph.D., P.E.
Planning Group Manager:	J. T. Newnam, P.E.
Urban Studies Unit Head:	R. T. Blackwood, P.E.
Project Engineer:	P. R. M. Slipp, M.S., P.E.
Engineering Associates:	E. Babson; H. McDowell
Transportation Technicians:	L. Snuggs; R. Stewart



Robert Talmadge Blackwood

Robert Talmadge Blackwood, P.E.

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CHAPTER 1

INTRODUCTION

This report documents the findings of a study of Siler City's thoroughfare system which began in 1993 and resulted in the mutual adoption of an updated Siler City Thoroughfare Plan by the Town of Siler City and the State of North Carolina in 1996. The previous Thoroughfare Plan was adopted in 1968, which was the Town's original one. You may refer to Chapter 5, Alternatives, for a discussion of constructed projects from that plan.

Staff from the North Carolina Department of Transportation met seven times with the Siler City Planning Board to discuss thoroughfare planning principles, provide technical information, receive local input on the goals and needs of the community, and to discuss the form of the updated plan. Department personnel also met three times with the Siler City Board of Commissioners to provide it with information and to receive guidance on the plan. The Town and the Department held a public information workshop for interested citizens to provide their input on the update of the plan; numerous comments were received at this informal meeting. The Board of Commissioners conducted a public hearing on the recommended thoroughfare plan on 18 March 1996 and adopted it on 18 March 1996. The plan was made official when the North Carolina Board of Transportation adopted it on 12 April 1996, in accordance with North Carolina General Statute 136-66.2.

Projected travel was the basis for the development of this thoroughfare plan. Alternatives were developed using the basic thoroughfare planning concepts described in Chapter 2 with consideration given to feasibility, local needs, and environmental impacts. Every effort was made to use as much of the existing street system as possible to minimize costs and environmental impacts.

Table 24 in Appendix G summarizes information on the various thoroughfares in tabular form. The recommended street cross sections are based on expected traffic volumes. Prior to the start of construction, a detailed review of each project must be made to insure that changing conditions have not affected the recommendations.

The recommended improvements are shown with their costs and benefits in order to define a recommended order of implementation. Responsibility for the proposed construction projects will be shared by the Town of Siler City and the State of North Carolina. In order for the plan to be effective, the Town and the State must procure in advance or protect by legal controls the right-of-way necessary for the proposed improvements.

The thoroughfare plan was based on the anticipated growth of the urban area. Actual growth rates and patterns may differ somewhat from those logically anticipated, and it may become desirable to accelerate or retard the development of thoroughfares or to make revisions to the plan to accommodate such variations in urban development. The entire plan may need to be reviewed in detail about every 10 years to bring it into line with changes in the rate of development and other comprehensive plans for the area. The thoroughfare plan should be consistent with other components of a comprehensive plan for the development of the urban area.

CHAPTER 2

THOROUGHFARE PLANNING PRINCIPLES

OBJECTIVES

The urban street system typically occupies 25 to 30 percent of the total developed land in an urbanized area. Since the system is permanent and expensive to build and maintain, much care and foresight must be exercised in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system to meet the existing and future travel needs within the urbanized area.

The primary purpose of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with changing travel demands. Proper planning for street development can avoid costly and needless expense. A thoroughfare plan will enable street improvements to be made as traffic demands increase and help to eliminate unnecessary improvements. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population and commercial enterprises affects major street and highway locations. Conversely, the location of major streets and highways within the urbanized area can influence the urban development pattern.

Other objectives of a thoroughfare plan include:

1. To provide for the orderly development of an adequate major street system as land development occurs;

2. To reduce travel and transportation costs;

3. To reduce the cost of major street improvements to the public through the coordination of the street system with private action;

4. To enable private interests to plan their actions, improvements, and developments with full knowledge of public intent;
5. To minimize disruption and displacement of people and businesses through long-range advance planning for major street improvements;
6. To reduce environmental impacts, such as air pollution, resulting from transportation activities;

7. To increase travel safety.

Thoroughfare planning objectives are achieved by improving the operational efficiency of thoroughfares and by improving the system efficiency through system coordination and layout.

OPERATIONAL EFFICIENCY

A street's operational efficiency is improved by increasing the capability of the street to carry vehicular traffic. A street's capacity is defined as the maximum number of vehicles which can pass a given point on a roadway during a given period of time under the prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, the nature of the traffic, and the weather.

Physical methods to increase vehicular capacity include street widening, intersection improvement, vertical and horizontal alignment improvement, and roadside obstacle elimination. For example, widening a street from two to four travel lanes more than doubles its capacity by providing additional maneuverability for traffic. Impedances to traffic flow caused by slow moving or turning vehicles and by adverse horizontal and vertical alignments are thereby reduced.

Operational methods to improve street capacity include:

1. Control of access: A roadway with complete access control can often carry three times the traffic handled by a non-controlled-access street with identical lane width and number;

2. Parking removal: This increases capacity by providing additional street width for traffic flow and by reducing friction to such flow caused by parking and unparking vehicles;

3. One-way operation: Initiating one-way traffic operations can increase the capacity of a street by 20 to 50 percent depending upon turning movements and overall street width. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and by simplifying traffic signal coordination;

4. Reversible lanes: These lanes may be used to increase street capacity in situations where heavy directional traffic flows occur during peak periods;

5. Signal phasing and coordination: Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operations;

Altering travel demand is a third method to improve the

efficiency of the existing street system. Travel demand can be reduced or altered in the following ways:

1. Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people-carrying capability of the street system;

2. Encourage the use of public transit and bicycles;

3. Encourage industries, businesses, and institutions to stagger work hours or establish variable work hours for employees. This will reduce the travel demand during peak periods and spread it over a longer time frame;

4. Encourage planning for the use or redevelopment of land in a more travel efficient manner.

SYSTEM EFFICIENCY

The development of a more efficient street system to better serve travel desires is another means for altering travel demand. A more efficient system can reduce travel distances, times, and costs. Improvements in system efficiency can be achieved through the concept of functional classification of streets and through development of a coordinated major street system.

FUNCTIONAL CLASSIFICATION

Streets perform two primary functions--traffic service and land service, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts compounded by uncontrolled and intensely used abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized as to function as local access streets, minor thoroughfares, or major thoroughfares.

Local access streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations on the streets would be served. Local streets may be further classified as either residential, commercial, or industrial depending upon the type of land use which they serve.

Minor thoroughfares are more important streets in the city system. They collect traffic from local access streets and carry

it to the major thoroughfare system. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function which may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and intercity traffic. The streets which comprise the major thoroughfare system may also serve abutting property, however, their major function is to carry traffic. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic, and each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

IDEALIZED MAJOR THOROUGHFARE SYSTEM

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desired lines of travel within an urban area and which permits movement between various areas of the city with maximum directness is the radial-loop system. This system consists of several elements: radial streets, crosstown streets, loop streets, and bypasses. Figure 1 shows this system.

Radial streets provide for traffic movement between points located in the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. A system of crosstown streets which forms a loop around the central business district is needed to avoid this problem. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the areas's border and allows central area traffic to circle and then enter the area near the appropriate destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function better in its role as a pedestrian shopping area.

Loop streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may go from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve it in central areas. One or more loops may exist, depending upon

the size of the urban area, and they should be spaced one half-mile to one mile apart, depending upon the intensity of land use.

A bypass is generally designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing from it traffic which has no desire to be in the city. Bypasses are usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volumes can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

THOROUGHFARE PLANNING PRINCIPLES APPLICATION

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized thoroughfare system are the conceptual tools available to the transportation planner to develop a thoroughfare plan. In actual practice, thoroughfare planning is performed for established urban areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and existing expectations of future land use. Compromises must be made because of these and many other factors that affect major street locations.

Certain basic principles must be followed throughout the thoroughfare planning process as closely as possible. These principles are:

1. The plan should be derived from a thorough knowledge of today's travel, its component parts and the factors which contribute to it, limit it, and modify it;

2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on relatively few streets;

3. The plan should conform to and provide for the land development plan of the area;
4. The plan must give consideration to urban development beyond the current planning period. Thoroughfares should be designated on a long-range planning basis to protect rights-of-way for future construction, particularly in outlying or sparsely developed areas which have development potential;
5. The plan must be consistent with the above principles, realistic in terms of travel trends, and economically feasible.

The basic concept of an idealized thoroughfare system has been outlined previously. Many factors influence the final location, design, and designation of streets on a thoroughfare system. One of the most important factors is the anticipated future traffic demand. In addition to this factor, others which influence the final design include:

1. Location of existing and anticipated major traffic generators such as shopping centers, central business districts, and larger industrial plants;

2. Existing residential patterns, schools, churches, cemeteries, and other social and recreational areas;

3. Topography and hydrology;

4. Location and design of existing highways and streets;

5. Level-of-service to be maintained on the street system;

6. Existing right-of-way and development adjacent to the present street system;

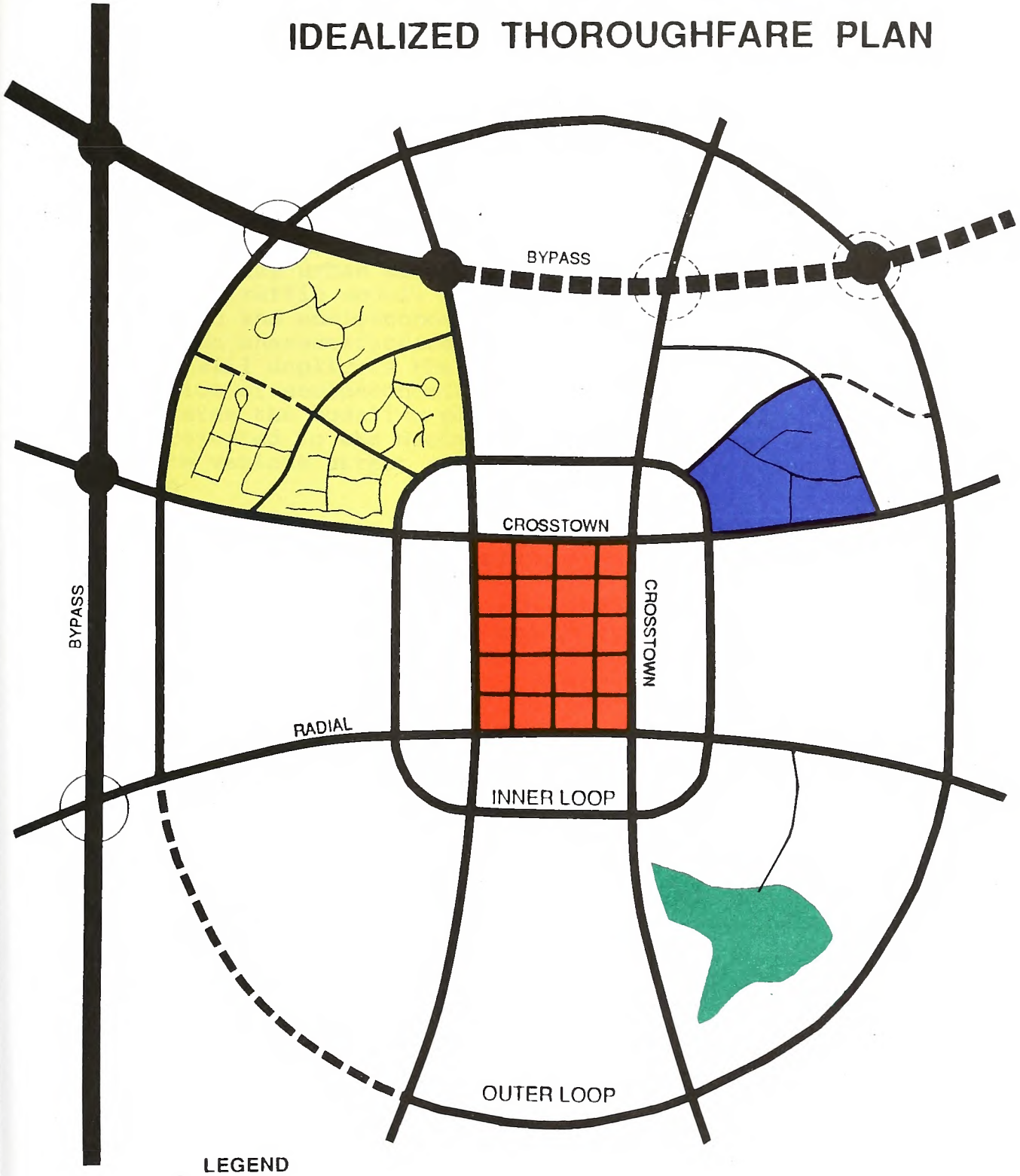
7. Anticipated future land use (this is important since the thoroughfare system will exert a major influence on future land development);

8. Anticipated availability of funds in establishing priorities for future improvements;

9. Environmental impacts of the thoroughfare system and its related highway construction;

10. Availability or anticipated development of other transportation modes, such as public transit, which could serve local travel desires.

IDEALIZED THOROUGHFARE PLAN



LEGEND

	EXISTING	PROPOSED
IOR THOROUGHFARE EEWAY	▬▬▬	▬ ▬ ▬
JOR OTHER	▬▬▬	▬ ▬ ▬
OR THOROUGHFARE	▬▬▬	▬ ▬ ▬
AL ROAD	▬▬▬	
ERCHANGE	●	●
ADE SEPERATION	○	○

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

FIGURE 1

CHAPTER 3

MODELING

Developing and calibrating a working traffic model is necessary in order to devise an efficient thoroughfare plan for the Siler City urban area. The following items are needed to develop a traffic model: definition of the study area, collection of traffic and socioeconomic data, determination of trip generation characteristics, calibration of the traffic model so that it will duplicate the patterns in the study area, and projection of socioeconomic data to the design year. Figure 2 illustrates the modeling process. Once the socioeconomic data has been projected to the design year, the model may be used to evaluate various street system problems and alternative solutions to them.

STUDY AREA

The study area boundary established in 1993 contains more land area than the 1968 plan did in order to better model growth occurring on Siler City's urban fringes. Figure 3 shows the 1993 study area.

In order to efficiently gather data and develop a computer model, the study area was divided into 39 traffic analysis zones. These zones vary in physical size, but are fashioned so as to have easily identifiable boundaries and relatively homogeneous land uses within them.

Inside the study area, two control lines were drawn across the study area. These screen lines were used to help calibrate the traffic model. Traffic counts taken along the screen lines indicated how much vehicular traffic was moving from one side of the study area to the other. The screen lines follow natural boundaries as much as possible in order to minimize the number of locations where traffic can cross.

Screen Line A starts at the western side of the study area boundary, a little bit south of US64, and heads eastward following a high voltage cross country power transmission line and then continues along an unnamed tributary of Blood Run Creek. It follows this tributary southeastward until it reaches Blood Run Creek itself, thereafter following this creek southward to another unnamed tributary. The Screen Line follows this tributary eastward to an area in the southwest quadrant of the intersection of SR1107 Third Street with SR1116 John Emerson Road. It then follows an unnamed tributary of Loves Creek eastward through the southern portions of Siler City until it reaches Loves Creek itself. Screen Line A then follows Loves Creek all the way to the Rocky River. It follows the Rocky River southeastward to the

eastern side of the study area above Marsh Creek, which is also the extraterritorial jurisdiction line. Screen Line A crosses the following roadways: SR1103 Dick Bridges Road, SR1102 Coleridge Road, SR1100 Airport Road, SR1120 Brower Road, SR1116 Emerson Road, North Garden Avenue, North Fir Avenue, North Evergreen Avenue, North Dogwood Avenue, SR1006 West Raleigh Street, SR1108 South Chatham Avenue, SR2113 Fayetteville Avenue, SR2206 South Second Avenue, US421 Freeway, and SR2229 Wastetreatment Plant Road.

Screen Line B starts at the southern boundary of the study area in the vicinity of SR1176 Old US421 Road and SR2114 Gees Grove Road and proceeds north along the Norfolk Southern Railroad track all the way through Siler City until it reaches the northern boundary of the study area in the vicinity of SR1006 Old US421 Road and SR1310 Poe Road. Screen Line B crosses the following roadways: SR1124 Glosson Road, SR1125 Patterson Street, West Elk Street, West Dolphin Street, SR1006 West Raleigh Street, West Second Street, SR1107 West Third Street, West Fifth Street, US64 West Eleventh Street, SR1108 Chatham Avenue and Hamp Stone Road, SR1105 Bish Road.

STREET NETWORK

The goal of the traffic model is to replicate the conditions on the street system. The existing street system must therefore be represented by a computer model. The construction of this model must maintain a balance between having too many streets represented so as to cause calibration to become unattainable and having too few streets represented so as to cause the model to not realistically duplicate existing conditions or not to provide sufficient detail for analysis. Generally, all major arterial roadways and some collector streets should be incorporated into the street system model. In the case of a smaller municipality like Siler City, a higher percentage of low-volume streets will be represented in the model. Arterials represented in the model include US64, US421, and SR1006. These roadways are represented both in the base year network and the design year network. Figure 4 shows the 1993 base year street network used in the Siler City model (which uses North Carolina Grid System X-Y coordinates). Construction of new streets and widenings of existing streets were added for the design year and are discussed in greater detail later in this report.

Street capacity is an important component of the model, and the volume-to-capacity ratio presents the best indication of existing and future traffic congestion. The capacity ranges for streets in the Siler City model are shown in Table 1.

Speed and street length are the major factors which define the minimum time path from zone to zone. The model uses minimum paths as the basis for assigning traffic to streets on the network. Generally, speeds assigned to links in the Siler City network are slightly below the posted speed limit. Common speeds

found in the model are 20, 30, 40, and 50 miles per hour.

TABLE 1
DAILY CAPACITY FOR LEVEL OF SERVICE D

SECTION	RURAL	SUBURBAN	URBAN
		Freeways	
4-lane	54,000	54,000	54,000
6-lane	81,000	81,000	81,000
8-lane	108,000	108,000	108,000
		Divided Roadways	
4-lane	50,000	37,000 - 41,700	18,000 - 22,000
6-lane	75,700	56,500 - 62,600	30,000 - 34,000
		Undivided Roadways	
3-lane	23,200	20,300 - 21,400	12,000 - 16,000
4-lane	48,000	33,500 - 39,400	18,000 - 22,000
5-lane	49,000	35,600 - 39,400	24,000 - 28,000
6-lane	71,100	50,300 - 55,700	30,000 - 34,000
7-lane	73,400	53,400 - 59,200	36,000 - 40,000
		Two Lane Roadways	
18 feet	9,000	8,500	8,000
20 feet	11,000	10,500	9,500
22 feet	12,000	11,500	11,000
24 feet	13,000	12,500	12,000
		One Way Roadways	
2-lane	---	---	14,000
3-lane	---	---	22,000
4-lane	---	---	30,000

All capacities measured in vehicles per day (vpd).

DATA REQUIREMENTS

Development of an adequate traffic model for the study area requires additional data besides the street network information. Traffic counts must be taken to provide a basis for calibrating the computer model. These counts provide a snapshot of traffic conditions in the study area and a benchmark by which to calibrate. Socioeconomic data in the form of housing surveys and employment surveys is needed to generate traffic volumes in the model. Tables 10, 11 and 12 in Appendix C show the 1993 base year socioeconomic data.

Traffic Counts

The model must be calibrated against existing conditions in the study area. Traffic counts must be taken at various locations around the study area in order to calibrate the model. Figure 5 shows the traffic count locations for the Siler City study area. These traffic counts were composed of three types.

Cordon line counts were taken at all locations where roadways crossed the study area boundary; these locations are known as external stations. These counts indicate how much traffic is entering the study area from outside its boundaries. Cordon line counts on major highways entering the planning area were generally taken over a 48-hour period with traffic recorded in 1-hour increments, with 24-hour period counts on minor highways.

Screen line counts were taken at all locations where streets crossed either of the two screen lines. These counts were used to determine the volumes of traffic moving across major portions of the study area. These counts also provided the primary accuracy check of the traffic model. Screen line counts were generally taken over a 48-hour period with traffic recorded in 1-hour increments on major roadways, with 24-hour counts on minor roads.

Coverage counts were taken on various streets within the study area. These counts serve as a secondary accuracy check for the model; by matching the volumes of the coverage counts, the model can be made to more closely duplicate the existing conditions in the study area. Coverage counts were generally taken over a 24-hour period.

Two vehicle classification counts were taken in Siler City, one on US421 Freeway at Loves Creek (Screen Line A) and the other on US64 at the bridge over the Norfolk Southern Railroad track (Screen Line B). These traffic counts give some indication of the vehicle mix on the primary roads in Siler City.

Socioeconomic Data

The necessary socioeconomic data comes via housing, employment, and commercial vehicle surveys. The dwelling unit count and commercial vehicle count form the basis for production of traffic. Likewise, the employee count (full- and part-time) forms the basis for attraction of traffic. The computer model assumes that houses produce trips and that jobs attract trips.

The best indicator of a household's potential to generate trips is its disposable income. No acceptable method of efficiently determining household disposable income exists, so dwelling unit type and quality are used as surrogate indicators. Dwelling units are divided into five categories of trip production

potential: excellent, above-average, average, below-average, and poor. Group housing, such as college dormitories or military barracks, is inventoried separately. Each dwelling unit category has a slightly different trip generation rate. Figure 6 includes the dwelling unit counts for each traffic zone.

Employment is used as a measure of potential trip attraction. A survey of employers in the study area was conducted at the same time as the housing survey. Employment was categorized by Standard Industrial Code (SIC) into five categories as follows:

SIC 1-49 INDUSTRY
Agriculture, Mining, Construction, Manufacturing, Transportation

SIC 50-54, 56-57, 59 SALES
Wholesale and Retail Trade

SIC 55, 58 SPECIAL
Gasoline Sales, Restaurants, Convenience Marts

SIC 60-67, 91-97 OFFICE
Finance, Insurance, Banking, Government

SIC 70-89 SERVICE
Hotels, Personal Services, Garages, Health, Education, Recreation

The category totals, by zone, were entered into a standard regression equation to develop the attractions for each zone.

Commercial Vehicles

Commercial vehicles have different trip generation characteristics than privately-owned automobiles in domestic use. A survey of commercial vehicles was performed at the same time as the employment survey.

TRIP GENERATION

The trip generation process is a procedure which uses the external station volumes, dwelling unit data, employment data, and commercial vehicle data to generate traffic volumes in the computer model to duplicate the volumes on the actual, existing street network. Through trip tables were developed from another model using external (cordon) station traffic. External-internal trip tables were developed from the Gravity Model using socioeconomic data and external station traffic. These two trip tables are then added together to produce a total trip table.

Traffic inside the study area consists of three types: through trips, external-internal trips, and internal trips. The thoroughfare planning definition of a trip is slightly different from the general public's definition. Technically, a trip has one

origin and one destination, while a lay definition of a trip would count a group of trips or chain of short trips as one long trip.

Through trips are produced outside the study area, enter and move through the study area without stopping, and end at a destination outside the study area. External-internal trips have one end point inside the study area and the other point outside it; they may either originate inside the area and proceed outward or originate outside the area and proceed inward. Internal trips have both their origin and their destination inside the study area; they never cross the cordon line (study area boundary). To better analyze them, they are broken down by purpose: home-based-work, other-home-based, and non-home-based.

Through Trips

The through trip table for the Siler City study was generated using the procedures of Synthesized Through Trip Table For Small Urban Areas[1]. This approach substitutes for the external origin and destination survey procedure which has fallen into disuse since the 1970s. The through trips are then subtracted from the external station volumes to derive the external-internal trips.

Internal Data Summation

IDS v2.01 [30 June 1992] is a computer program which takes the external-internal traffic volumes, the dwelling data, the employment data, the commercial vehicle data, the generation rates, and the regression equations and generates the trip productions and trip attractions needed for use in the Gravity Model. The IDS procedure has been adapted to the microcomputer, and the data is entered in a file in ASCII format using PROFESSIONAL WRITE v2.2. This information has three parts: dwellings and commercial vehicles, employment, and calculations. Table 2 shows the trip production rates used in the Siler City study. The average rate for dwelling units in the 1993 base year was 9.04 trips per dwelling unit. Although rate was somewhat high by statewide standards, it compensated for the downward skew in the base year ratings.

Trip attractions where calculated using a standard regression equation which considers attractions to be a function of employment characteristics of the traffic zone. This equation is:

$$Y = AX_1 + BX_2 + CX_3 + DX_4 + EX_5 + FX_6$$

The three types of internal trip attractions and the external-internal trip attractions were generated using the following set of equations derived from the generic equation above.

Home-Based-Work Trip Attractions:

$$Y = 1.0X_1 + 1.0X_2 + 1.0X_3 + 1.0X_4 + 1.0X_5$$

Other-Home-Based Trip Attractions:
$Y = 1.0X_1 + 1.8X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5 + 0.5X_6$

Non-Home-Based Trip Attractions:
$Y = 1.0X_1 + 1.8X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5 + 0.5X_6$

External-Internal Trip Attractions:
$Y = 1.0X_1 + 1.8X_2 + 8.4X_3 + 2.6X_4 + 2.5X_5 + 0.5X_6$

where the X_1 through X_5 are the numbers of employees categorized by the following groups:

Y = Trips Attracted

X_1 = Industry SIC 1-49

X_2 = Sales SIC 50-54, 56-57, 59

X_3 = Special SIC 55, 58

X_4 = Office SIC 60-67, 91-97

X_5 = Service SIC 70-89

and where X_6 is the number of dwelling units in the zone.

The output of the IDS program is divided into trip productions and trip attractions for each zone, broken down by the four types of trips: home-based-work, other-home-based, non-home-based, and external-internal. The trips are segregated by type because each has a different trip length frequency distribution associated with it. In the Siler City study, the internal trips were broken down into 30% HBW, 45% OHB, and 25% NHB.

TABLE 2
SILER CITY TRIP PRODUCTION RATES

CLASSIFICATION	TRIPS PER DAY
Dwelling Units:	
Excellent	13.0
Above Average	12.0
Average	11.0
Below Average	10.0
Poor	9.0
Commercial Vehicles:	
Taxis	40.0
Autos	6.7
Trucks	6.7

Internal Trip Distribution

After the number of trips per traffic zone is determined, they must be distributed to the other zones. The preferred method of distributing trips is called the Gravity Model and states that the number of trips between Zone 1 and Zone 2 is equal to the number of trips produced in Zone 1, multiplied by the number of trips attracted to Zone 2, multiplied by a travel time factor between the zones, and then divided by the sum of all zone attractions multiplied by their travel time factors.

$$T_{ij} = \frac{P_i * A_j * F_{ij}}{SUM\{x=1,n\} \; A_x * F_x}$$

T_{ij} = the number of trips sent from zone **i** to zone **j**

P_i = the number of trips produced in zone **i**

A_j = the number of trips attracted to zone **j**

F_{ij} = the travel time factor between zone **i** and zone **j**

n = the total number of zones

i = the origin zone number

j = the destination zone number

x = any zone number

The travel time factor or friction factor (F) is critical to the gravity model distribution and must be derived empirically. The travel time factor is dependent on the distance between the traffic zones and the time necessary to travel that distance. The travel time factor is also dependent on the trip purpose. In order to derive the travel time factor, a gravity model calibration program was run with an initial value of travel time factor and a trip length frequency curve for each trip purpose. The initial travel time factor used in the Siler City model was 100 for all trip purposes and time increments. Figures 7 through 10 show the trip length frequency curves for each trip purpose, and Table 18 and Table 19 in Appendix E show the actual values for the trip length frequency distribution.

MODEL CALIBRATION

The purpose of the traffic model is to predict the traffic on a street system at some future point in time; however, if the model does not do this accurately, then it is useless. The major test of a traffic model's validity is whether or not the model will duplicate the existing traffic pattern on the base year

street network. The actual calibration of the model is an iterative process in which incremental changes are made either in the trip generation, the trip distribution, or the street network. The goal of each change is to make the model more accurately reflect the real world conditions upon which it is based. Only when the model can adequately reflect traffic in the base year can it be used to predict traffic in the future year.

Accuracy Checks

Three different checks have been performed upon this model. The first check is to follow trips through all the steps involved in the model. This check insures that no trips have accidentally been added or subtracted from the model or counted twice. The second check is to compare the model-generated trips across the screen lines with the ground counts taken at those stations. A model accurately reflects the overall travel patterns if the model trips are from 95% to 105% of the ground counts across the screen lines. Table 3 shows the comparison of ground counts to model volumes on the screen lines.

The computer model volumes across Screen Line A and B are very close to their respective ground counts. The volumes across Screen Line A are low by only 904 trips per day, and the volumes across Screen Line B are high by only 768 trips per day. The actual traffic volumes on most modeled streets in Siler City are relatively low by statewide standards, and small changes in the computer assigned volumes are reflected as seemingly larger changes on a percentage basis.

TABLE 3
SILER CITY GROUND COUNT TO COMPUTER MODEL COMPARISON

SCREEN LINE	GROUND COUNT	COMPUTER MODEL	MATCH
A (E-W)	29,532	28,628	96.9%
B (N-S)	23,964	24,732	103.2%

Special Considerations

The computer model was most successful at replicating traffic patterns on higher-volume roadways such as US64, US421, SR1006, and so forth. In general, as ground count volumes decreased, the computer-generated values became less accurate in matching those counts. Network streets passing through the central business district or those with closely parallel facilities were difficult to model well. Over the entire network, the computer volume to ground count match was 104.9%. For lower count roadways, if a difference occurred, the computer volume was generally higher than the ground count. Conversely, for higher count roadways, differences were more likely to be a lower assigned volume

relative to the ground count.

DATA PROJECTION

The base year data must be appropriately modified in order to make the computer model reflect assumed or projected conditions in the design year. Future year development may or may not occur in the places and in the types anticipated, but an estimate must be made so that the computer model can reflect that future year.

Socioeconomic Data

Table 4 shows population data for the study area. The Siler City Department of Planning and Community Development prepared the projections of socioeconomic data used in the computer model. These projections are based upon previously experienced rates and upon the land use planning done by the Town. These projections were used along with the previously-developed regression equation to generate the design year trip productions and trip attractions, in a similar manner to the base year procedure.

Dwelling unit projections show a moderate growth rate of 1.3% annually from 1993 to 2020. The distribution of dwellings among the five classifications of trip production changes rather significantly between the base year and the design year, as the base year values contained a noticeably downward skew. Figure 11 shows the percentages of each type of rating.

Employment projections also show a modest growth rate of 0.9% annually. Relatively little change in the relative percentages for each type of employment should occur. Figure 12 shows the distribution for the base and design years.

External And Through Trips

The average daily traffic (ADT) values for the cordon (external) stations in the design year were developed using trend analysis and modified as needed based upon anticipated growth beyond those points and the potential influence of relevant highway projects in the area. These future volumes were then split into through trips and external trips using the procedures of Synthesized Through Trip Table For Small Urban Areas. Cordon station traffic was projected to grow at annualized rates of 2.1% to 2.8% on US-numbered routes, 1.7% to 3.4% on major SR-numbered routes, and 1.6% to 3.3% on minor SR-numbered routes. Design year ADT values were rounded to the nearest 500 vehicles per day. Table 21 in Appendix E shows the ADT values for each station.

Internal Trips

Internal trips in the design year were produced using IDS and the dwelling unit, employment, and commercial vehicle projections. Table 5 shows the trip types for the base and design years.

TABLE 4

SILER CITY THOROUGHFARE PLAN POPULATION DATA

YEAR	PERSONS	DWELLINGS	PERS/DWELL
	North Carolina		
1960	4,556,155	1,322,957	3.44
1970	5,084,411	1,641,015	3.10
1980	5,880,095	2,274,196	2.59
1990	6,628,637	2,818,193	2.35
	Chatham County		
1960	26,785	7,572	3.54
1970	29,554	9,621	3.07
1980	33,415	12,896	2.59
1990	38,759	16,642	2.33
	Matthews Township		
1960	7,718	2,051	3.76
1970	8,838	2,796	3.16
1980	8,766	3,282	2.67
1990	9,406	3,820	2.46
	Siler City		
1960	4,455	1,347	3.31
1970	4,689	1,606	2.92
1980	4,446	1,730	2.57
1990	4,808	2,027	2.37
	Thoroughfare Plan Study Area		
1993	8,028	3,211	2.50
2020	10,635	4,584	2.32

1. North Carolina, Chatham County, Matthews Township, and Siler City data from United States Department of Commerce Population And Housing Unit Counts: North Carolina (1990-CPH-2-35).
2. Thoroughfare Plan Study Area data from Siler City Planning Department counts and estimates.
3. The Thoroughfare Plan Study Area is larger than Siler City Extraterritorial Jurisdiction limits but smaller than Matthews Township limits.

TABLE 5
SILER CITY BASE YEAR TO DESIGN YEAR TRIP COMPARISON

TRIP TYPE	1993	2020
Internal (+Secondary)	36,122	59,204
External-Internal	28,084	45,721
Through	6,662	17,786

All values in vehicles per day.

Reference 1: North Carolina Department of Transportation, Division of Highways. Synthesized Through Trip Table For Small Urban Areas. Technical Report 3. NCDOT: Raleigh, 1980. (along with Computer Supplement To Technical Report #3, 1991)

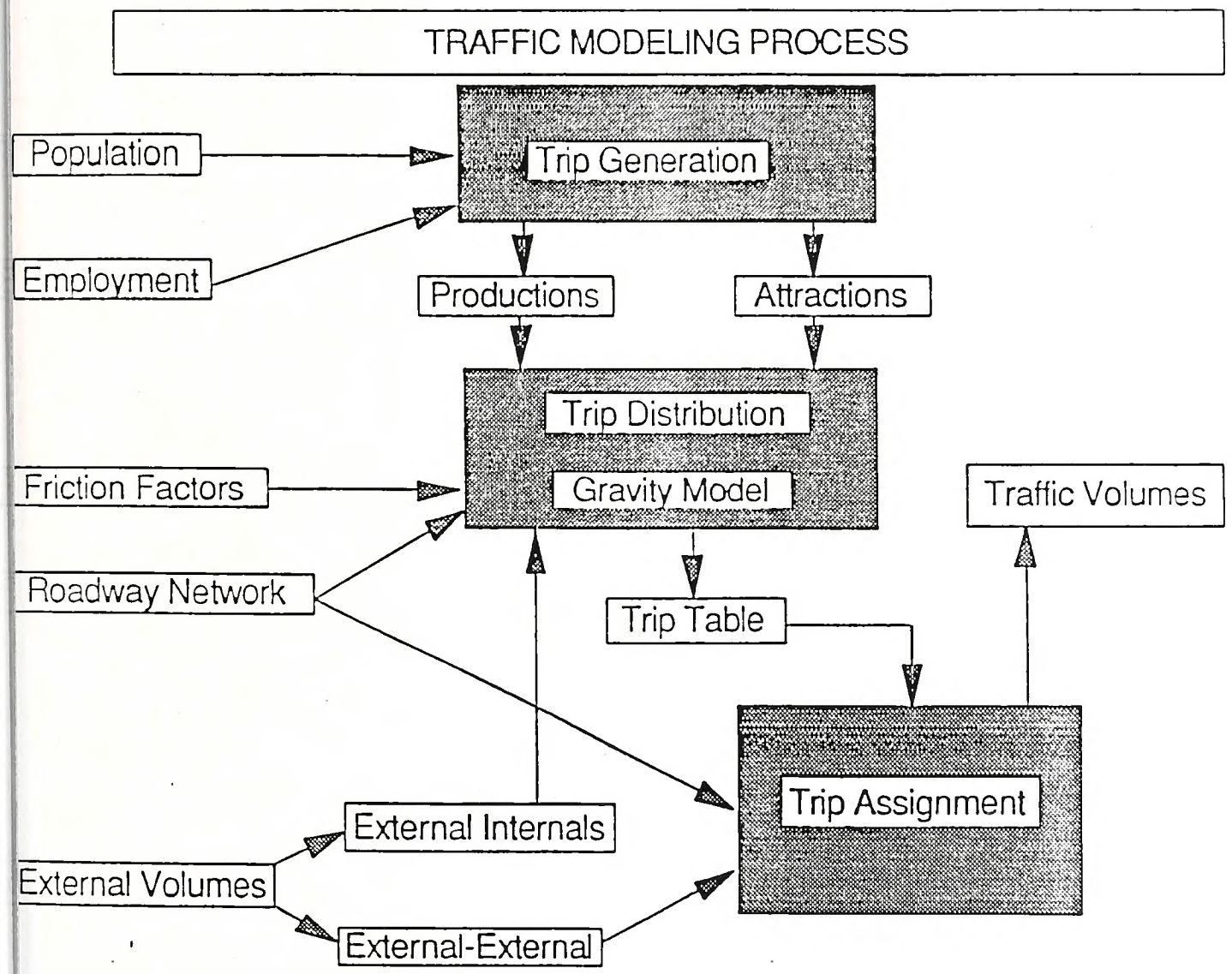
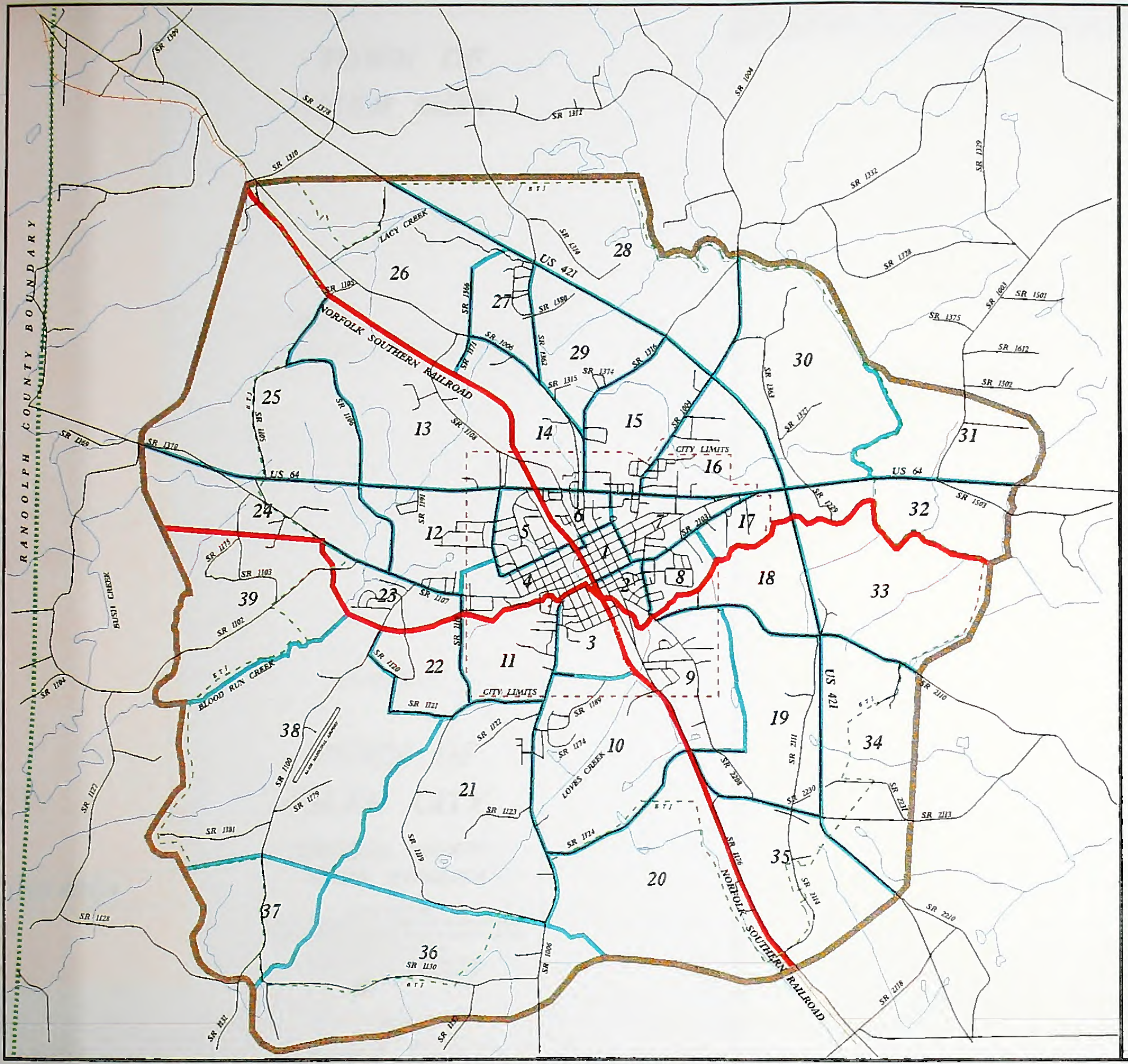

TRAFFIC MODELING PROCESS
Population
Trip Generation
Employment
Productions
Attractions
Trip Distribution
Friction Factors
Gravity Model
Traffic Volumes
Roadway Network
Trip Table
Trip Assignment
External Internals
External Volumes
External-External

FIGURE 2


STUDY AREA
ZONE MAP
CORDON LINE
SCREEN LINE
ZONE LINE
19 ZONE NUMBER
TOWN OF
SILER CITY
CHATHAM COUNTY
NORTH CAROLINA
PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SCALE
0 1 2 MILES
FIGURE 3
RANDOLPH COUNTY BOUNDARY
NORFOLK SOUTHERN RAILROAD
LAGY CREEK
BUSH CREEK
BLOOD RUN CREEK
LOVES CREEK
CITY LIMITS
US 421
US 64
SR 1378
SR 1310
SR 1317
SR 1334
SR 1332
SR 1329
SR 1328
SR 1501
SR 1375
SR 1612
SR 1502
SR 1503
SR 1363
SR 1322
SR 1366
SR 1358
SR 1005
SR 1462
SR 1315
SR 1374
SR 1316
SR 1004
SR 1105
SR 1106
SR 1104
SR 1369
SR 1370
SR 1991
SR 1228
SR 1103
SR 1107
SR 1102
SR 1120
SR 1121
SR 1122
SR 1189
SR 1174
SR 1100
SR 1179
SR 1181
SR 1123
SR 1124
SR 1119
SR 1128
SR 1130
SR 1006
SR 1176
SR 1114
SR 2208
SR 2230
SR 2231
SR 2111
SR 2110
SR 2113
SR 2210
SR 2118
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

RANDOLPH BOUNDARY
SR 1309
SR 1378
SR 1310
SR 1322
SR 1304
SR 1372
SR 1329
SR 1328
SR 1307
SR 1501
SR 1375
SR 1612
SR 1507
LAGY CREEK
US 421
SR 1314
SR 1306
SR 1380
SR 1377
SR 1305
SR 1374
SR 1316
SR 1364
SR 1371
SR 1308
SR 1315
NORFOLK SOUTHERN RAILROAD
SR 1368
SR 1378
US 64
CITY LIMITS
SR 1370
SR 1375
SR 1383
SR 1387
SR 1382
SR 1381
SR 1379
SR 1373
SR 1376
SR 1384
SR 1385
SR 1386
SR 1388
SR 1389
SR 1390
SR 1391
SR 1392
SR 1393
SR 1394
SR 1395
SR 1396
SR 1397
SR 1398
SR 1399
SR 1400
SR 1401
SR 1402
SR 1403
SR 1404
SR 1405
SR 1406
SR 1407
SR

TOWN OF SILER CITY

1993 BASE YEAR TRAFFIC COUNT LOCATIONS

LEGEND

DAILY COUNTS (STATION 1– 82)

HOURLY COUNTS (STATION 83 – 99)

CLASSIFICATION COUNTS (STATION 100 – 101)

FIGURE 5

TOWN OF SILER CITY

CHATHAM COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 1 2
MILES

STUDY AREA
ZONE MAP

CORDON LINE
SCREEN LINE
ZONE LINE
XX ZONE NUMBER

LEGENDS

XXX 1993 DWELLINGS
XXX 1993 EMPLOYEES

FIGURE 6

TOWN OF SILER CITY

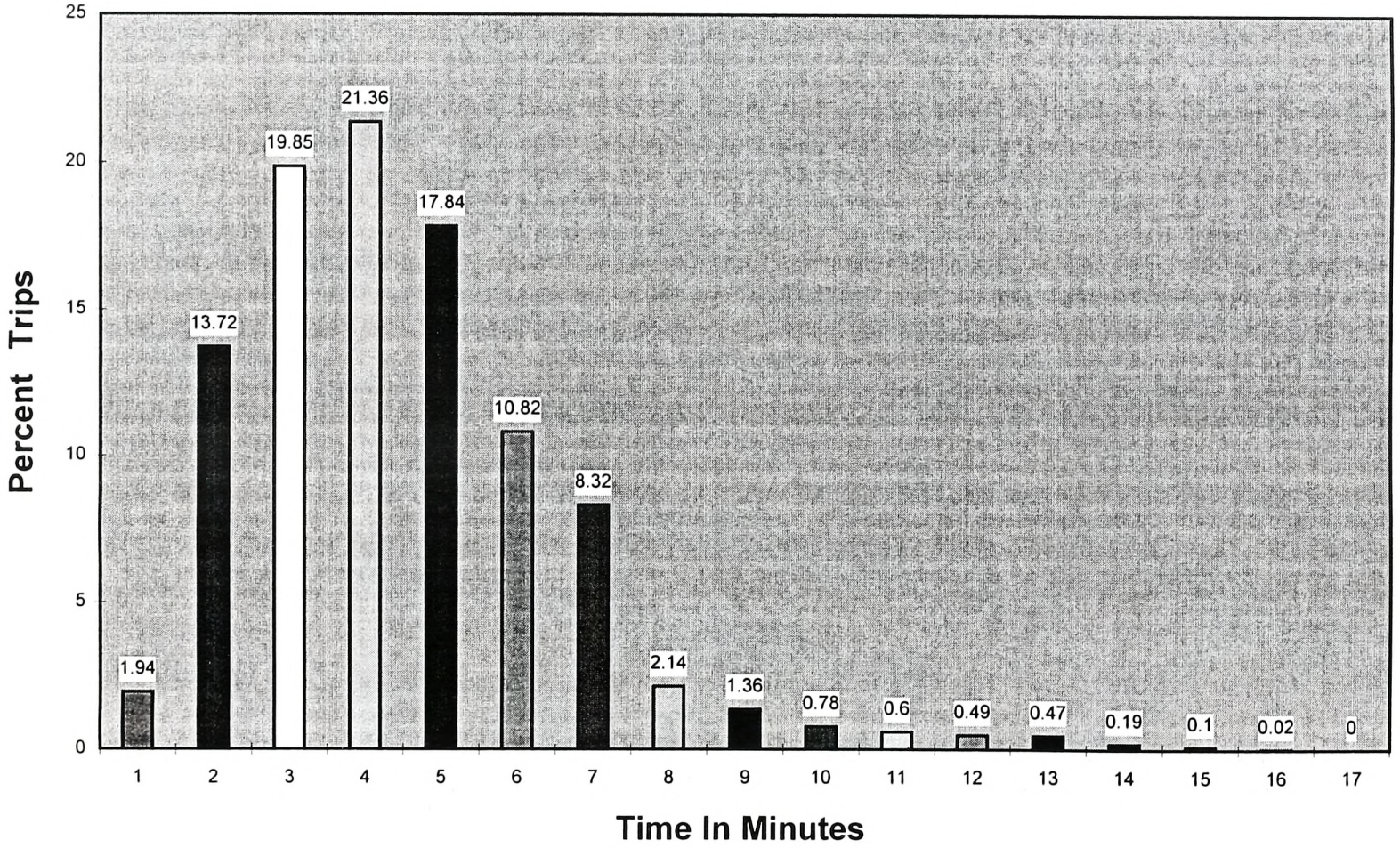
CHATHAM COUNTY NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

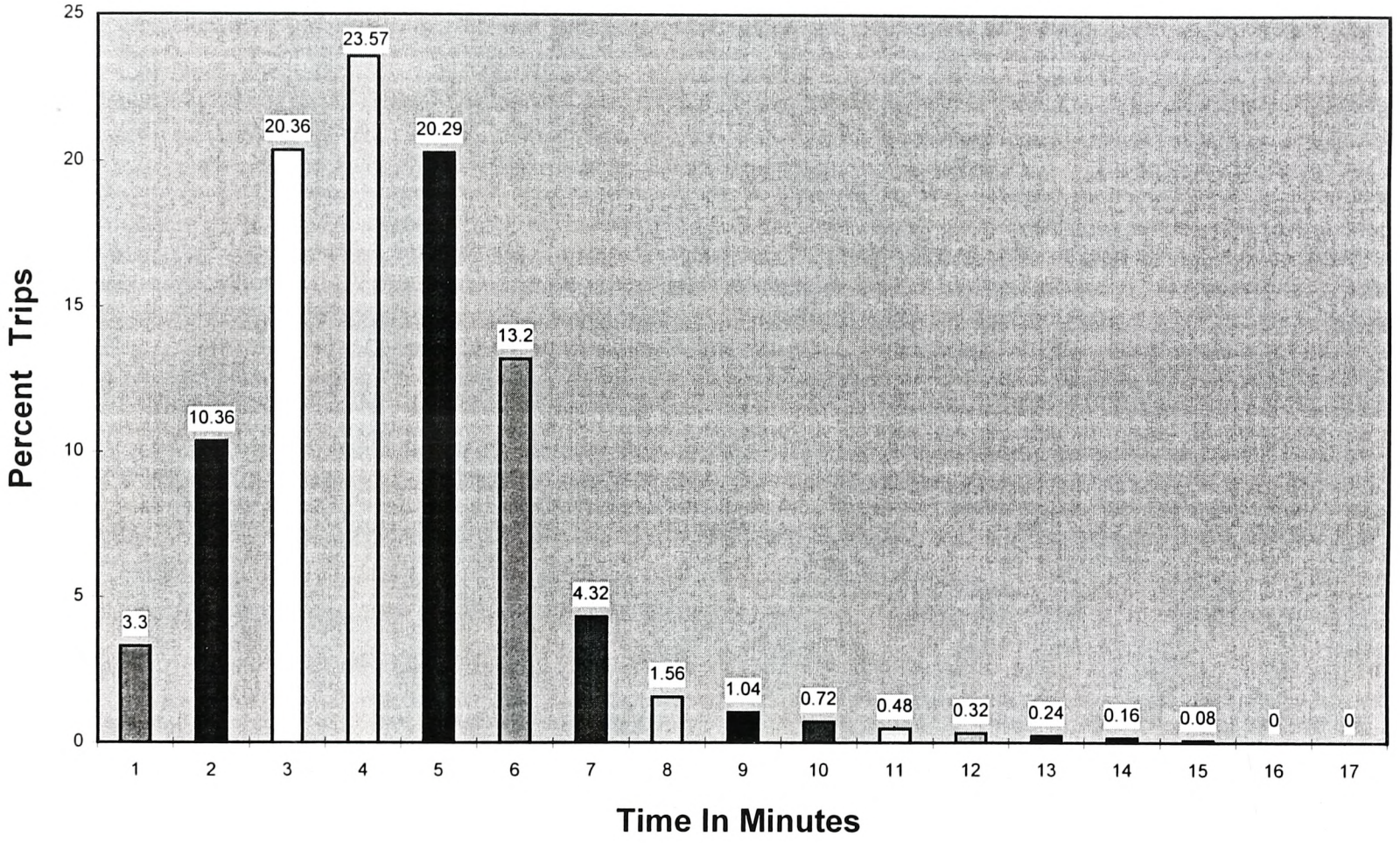
0 1 2
MILES

ZONE	DWELLINGS	EMPLOYEES
1	82	232
2	54	181
3	106	42
4	163	105
5	196	184
6	102	413
7	325	1530
8	127	350
17	107	192

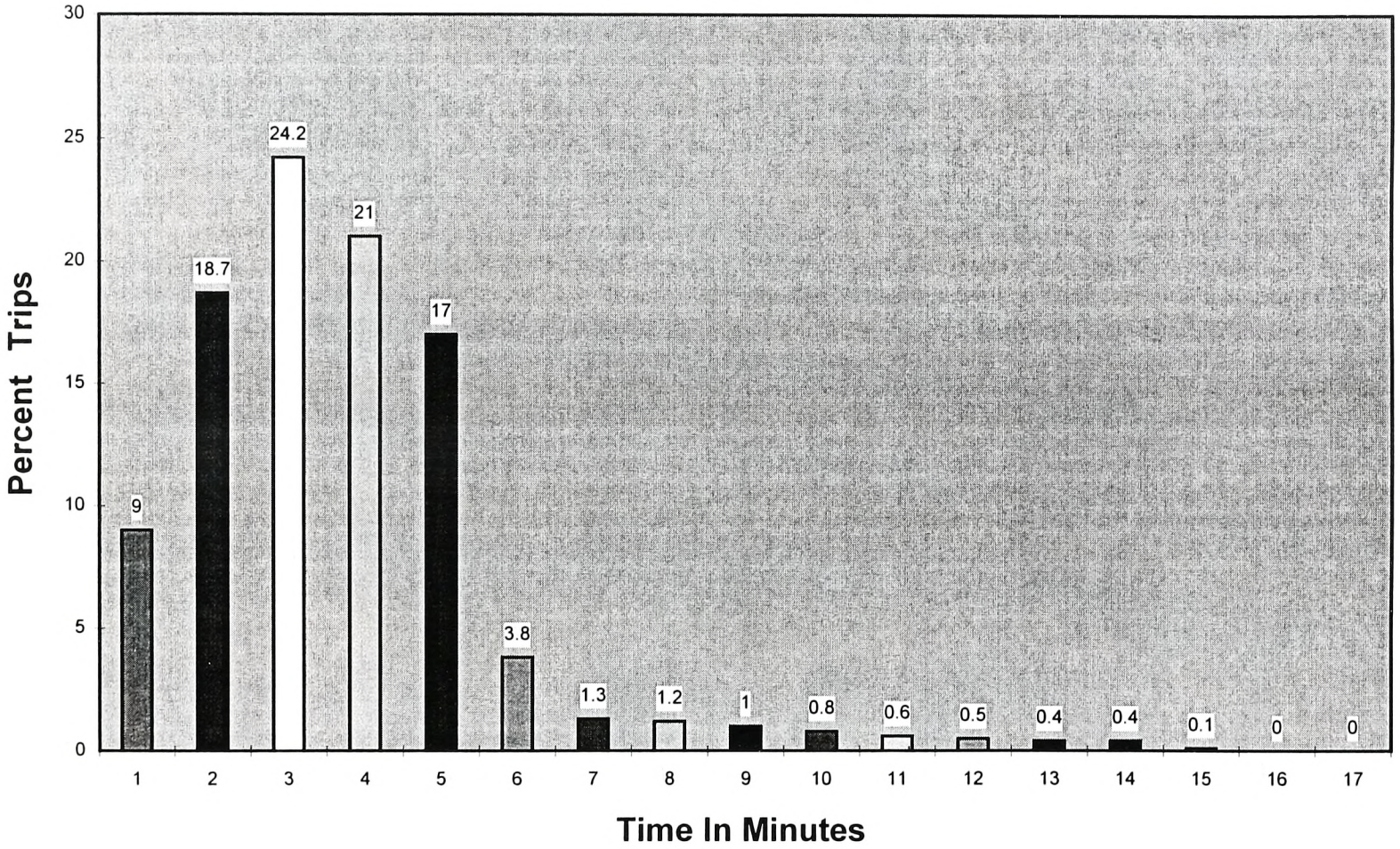
Home Base Work Trip Length Frequencies
Figure 7



Other Home Based Trip Length Frequencies
Figure 8



Non Home Based Trip Length Frequencies
Figure 9



External Internal Trip Length Frequencies
Figure 10

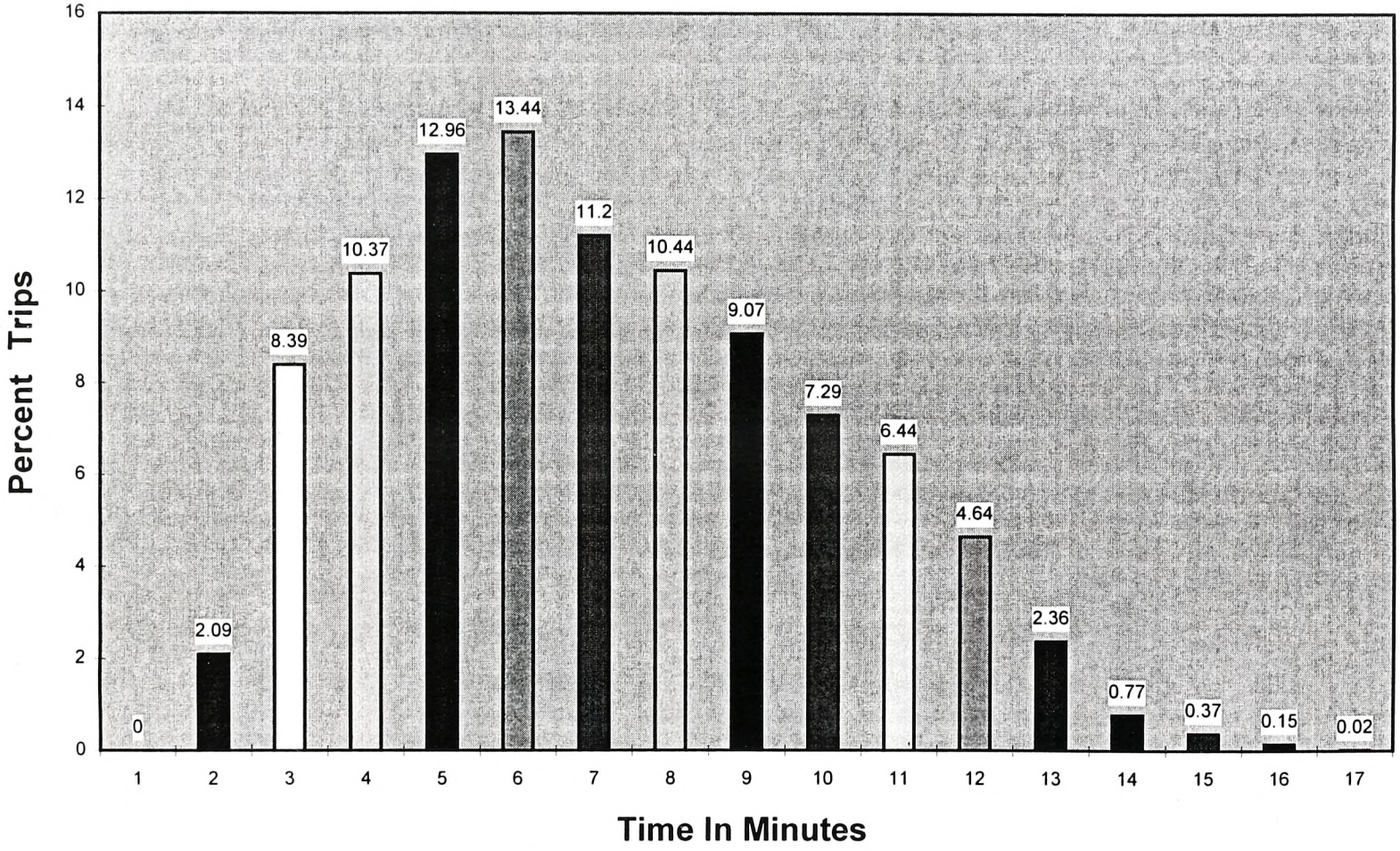


FIGURE 11

SILER CITY THOROUGHFARE PLAN

DWELLING UNITS COMPARISON

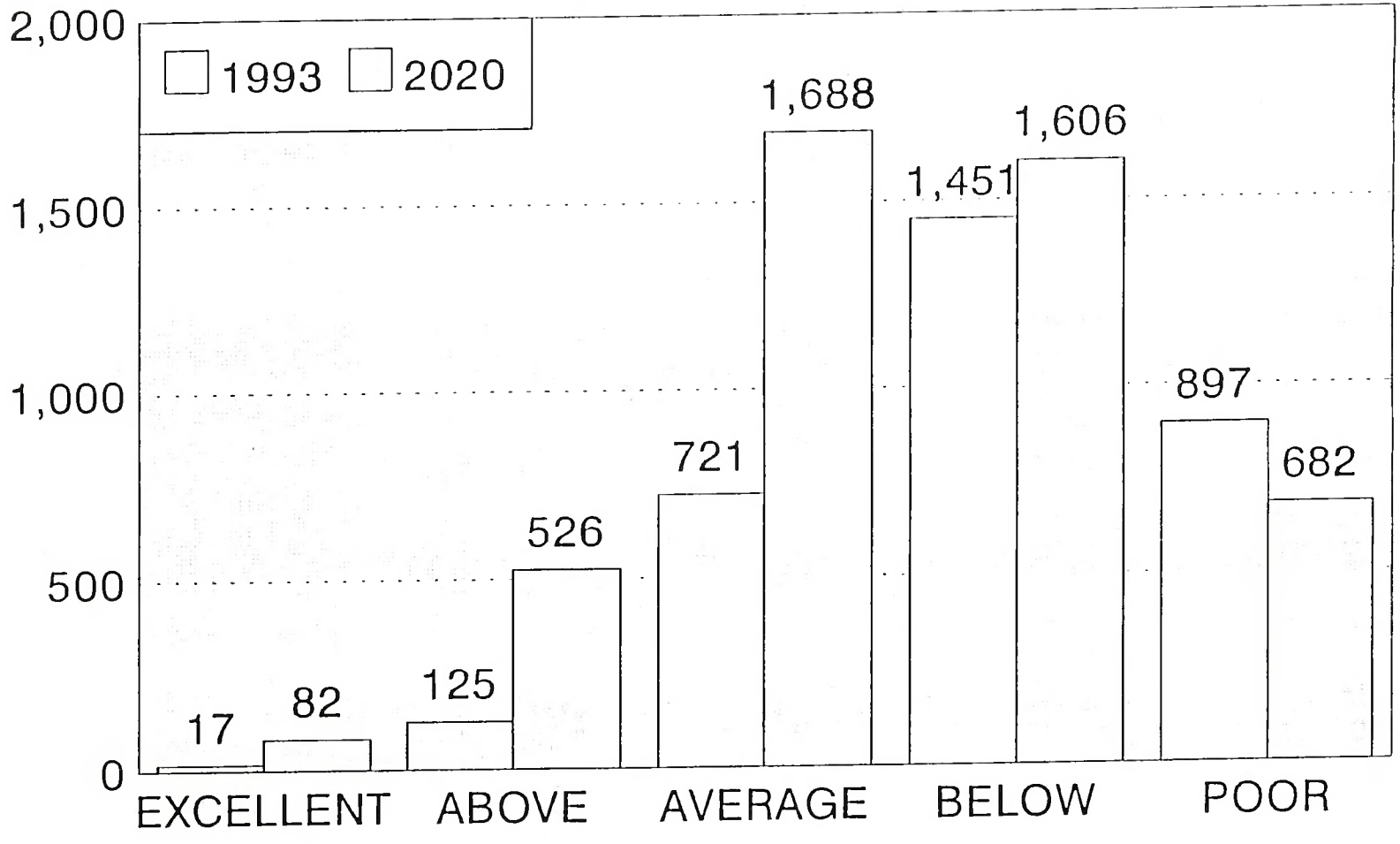


FIGURE 11

SILER CITY THOROUGHFARE PLAN

EMPLOYEES COMPARISON

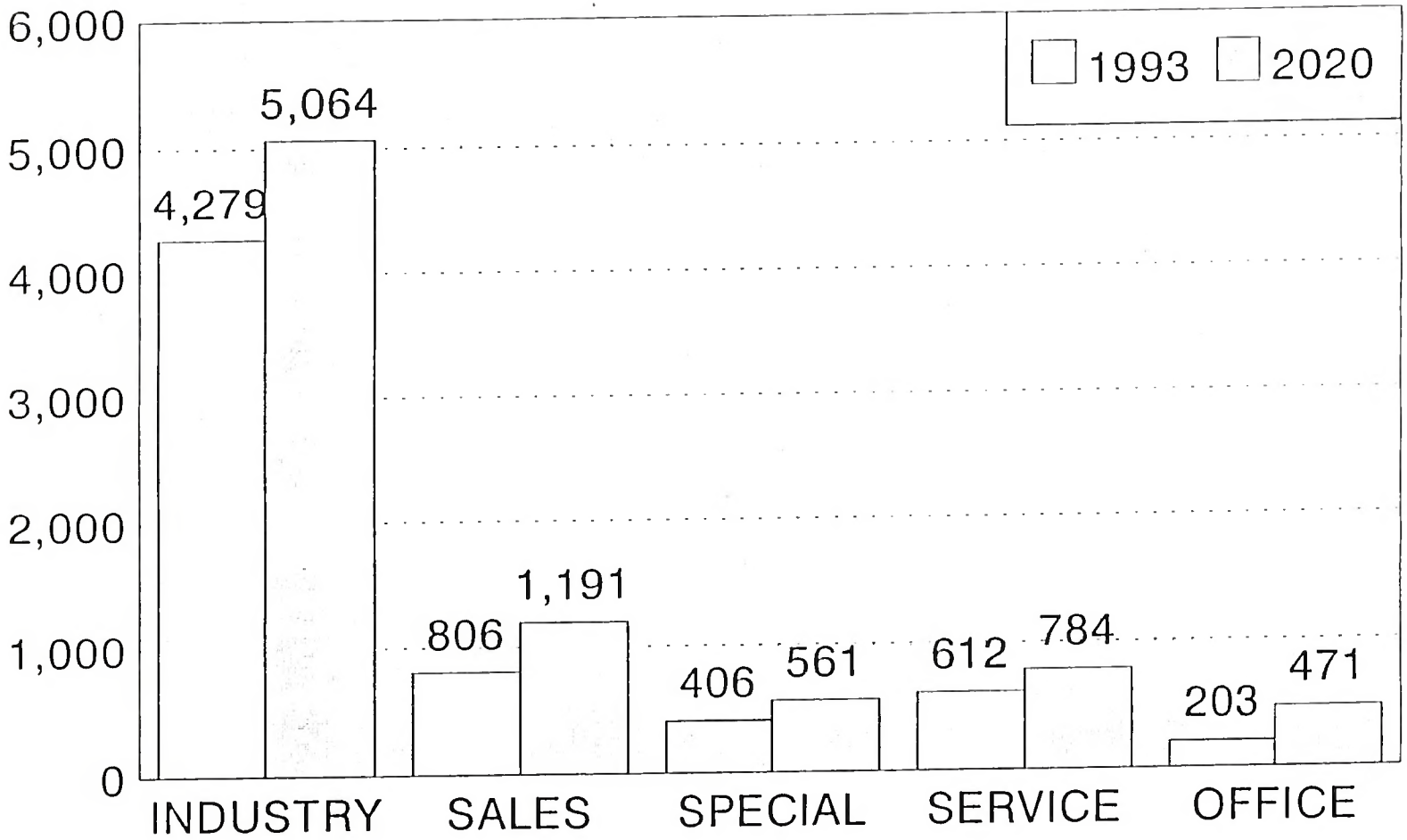


FIGURE 12

SILER CITY EXTERNAL STATION TRAFFIC
US-NUMBERED ROUTES

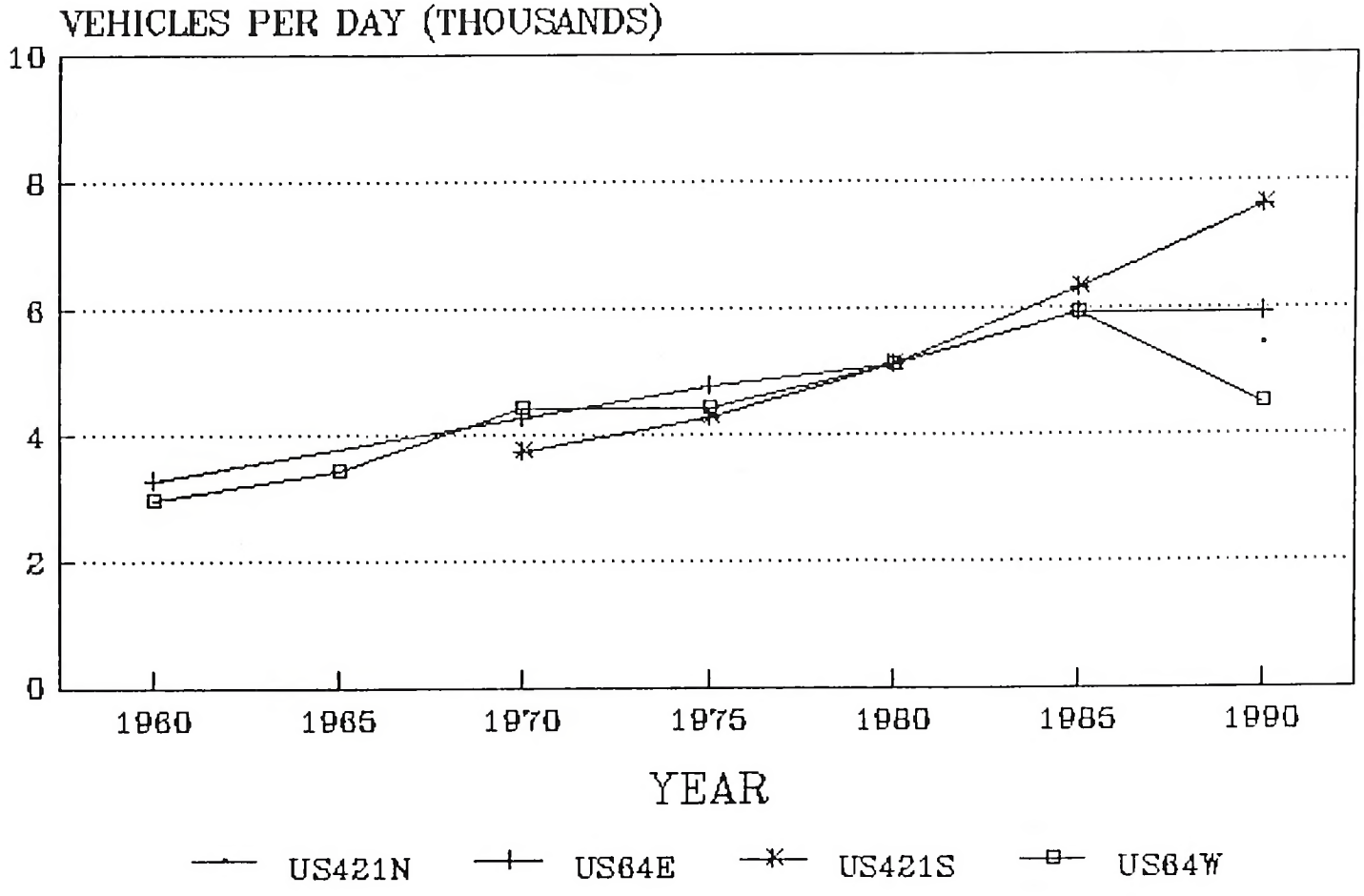


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FIGURE 13

SILER CITY THOROUGHFARE PLAN
SR-NUMBERED ROUTES (MAJOR)

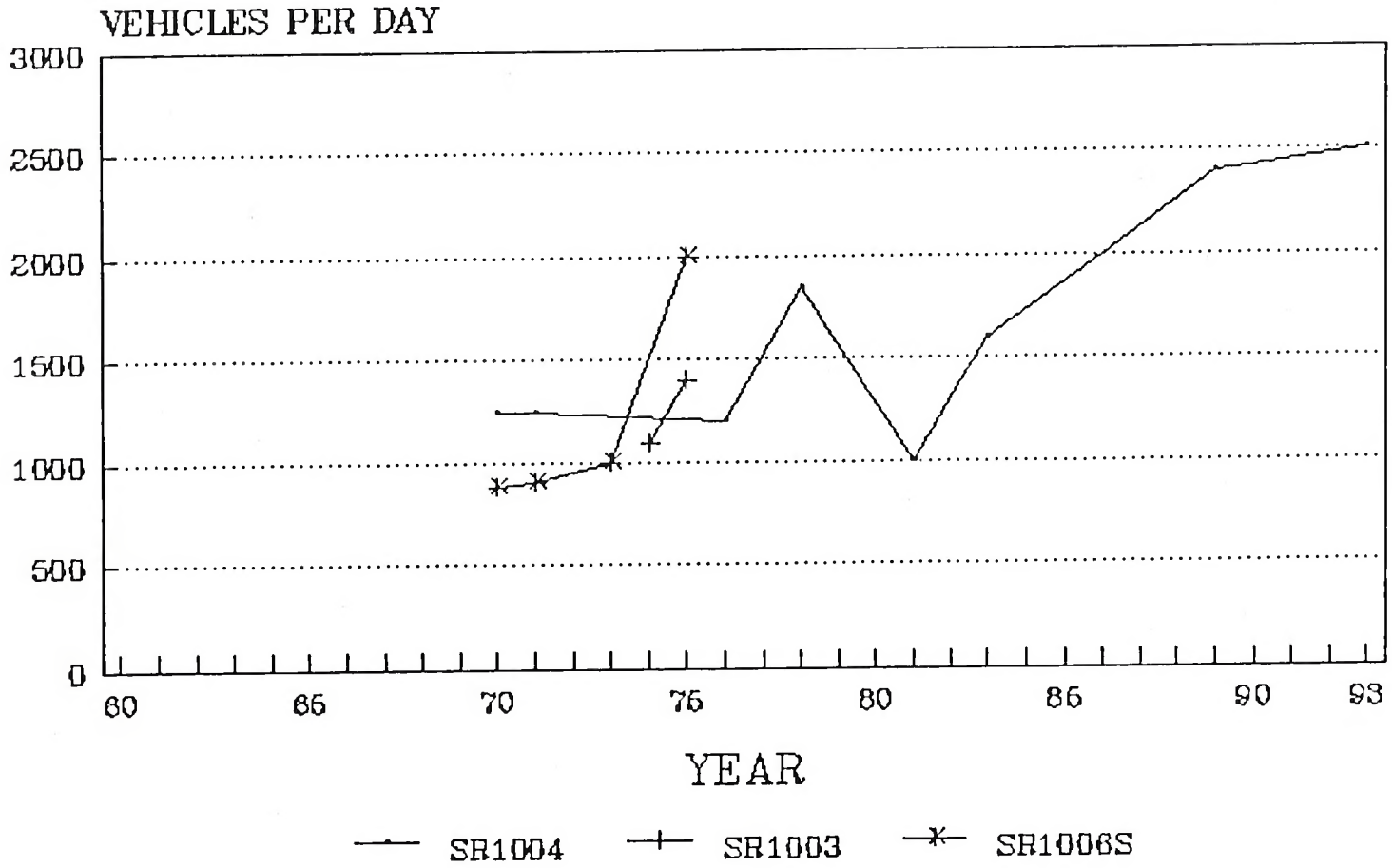

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FIGURE 14

SILER CITY THOROUGHFARE PLAN
SR-NUMBERED ROUTES (MINOR)

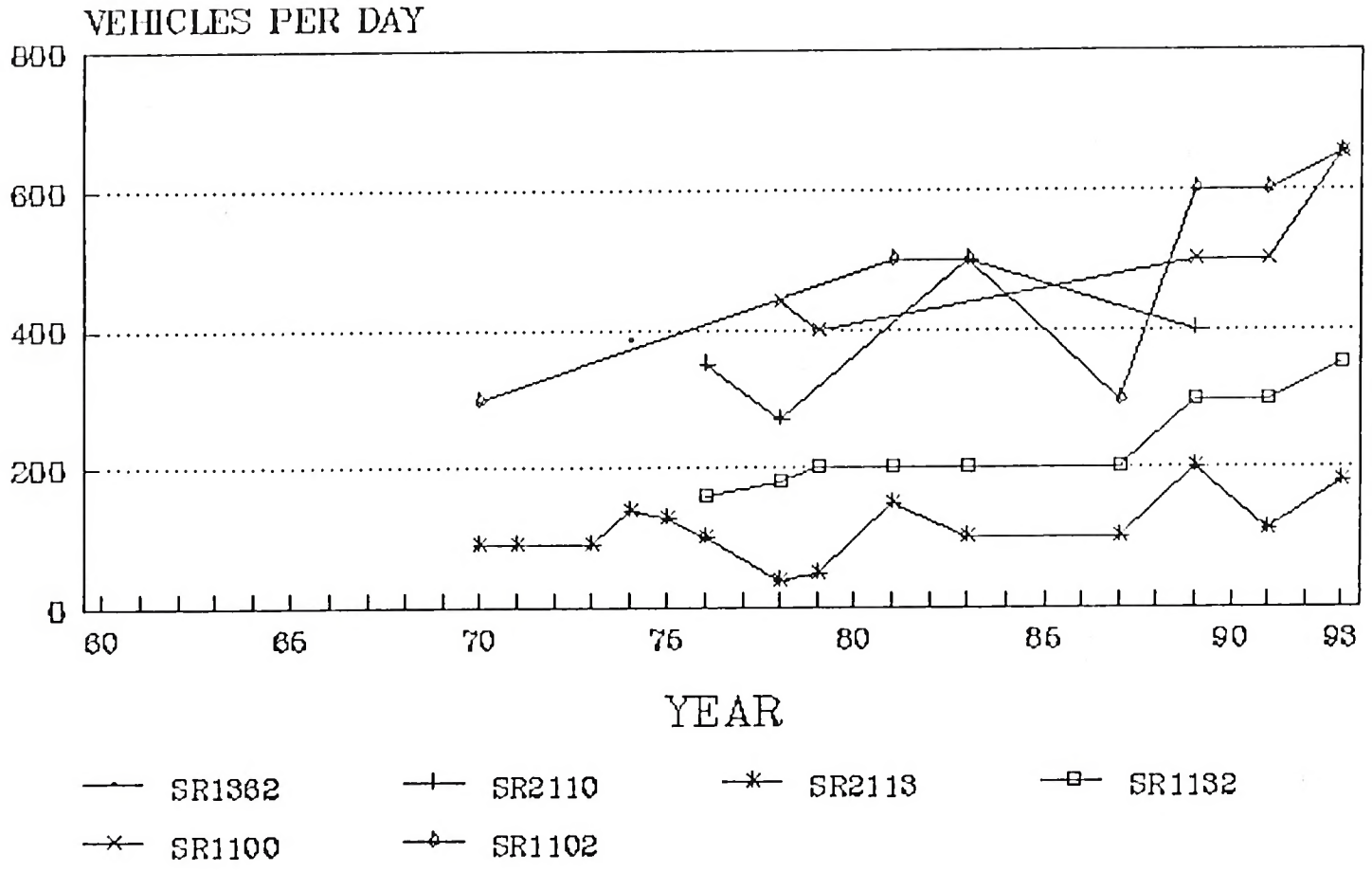

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FIGURE 15

CHAPTER 4

ANALYSIS

CAPACITY AND LEVELS OF SERVICE

A comparison of traffic volumes to the ability of the streets to move that traffic gives a relatively good indication of the adequacy of the existing street system. In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, the width of the pavement, and the utilization of traffic control devices. The ability of a street to move traffic can be improved by restricting parking and turning movements, by using proper sign and signal devices, and by applying various other traffic engineering techniques. "The capacity of a facility is defined as the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions."[1] The ratio of traffic volume to roadway capacity determines the level of service provided.

"Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations, from A to F, with level-of-service (LOS) A representing the best operating conditions and level-of-service F the worst."[2]

Level-of-service definitions--In general, the various levels of service are defined as follows for uninterrupted flow facilities:

1. Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

2. Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A. The level of comfort and convenience provided is somewhat less than at LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

3. Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now

affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

4. Level-of-service D represents high-density, but stable, flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

5. Level-of-service E represents operation conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

6. Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and these are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of breakdown. It should be noted, however, that in many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good. Nevertheless, it is the point at which arrival flow exceeds discharge flow which causes the queue to form, and level-of-service F is an appropriate designation for such points.

Various reasons may exist for traffic-carrying deficiencies on any particular street. They range from system-level problems down to project-level traffic engineering problems of operational nature. Whenever a street is deficient in its traffic-carrying ability, it is reflecting both system-level and project-level problems. The long-range solution of the deficiency must address the system-level problem simultaneously with the project-level problem. For example, a simple street widening solution to a particular congestion problem may serve only to shift the problem to another point in the planning area. A better solution may be to construct a new street which could reduce the volumes of traffic at the trouble spot and to concurrently try to maximize the efficiency of the overburdened street by employing good traffic operation measures. Many factors must be considered: land may not be available for new construction so the only alternative

is to widen; economics may dictate that the cheapest solution to traffic problems (but not necessarily the best) be implemented.

Many of the factors responsible for street deficiency are listed below:

1. Travel demand that greatly exceeds the transportation system's capacity.

2. Roadway parameters which include:
   a. lane width
   b. lateral clearances
   c. shoulders
   d. auxiliary lanes, including parking lanes, speed-change lanes, turning lanes, and storage lanes
   e. surface conditions
   f. alignments
   g. grades

3. Traffic parameters which account for traffic composition, habits, and desires, and include:
   a. trucks
   b. buses
   c. lane distribution
   d. variations in traffic flow during peak hour
   e. traffic interruptions

4. Local condition parameters which represent the characteristics of the traffic demand as reflected in the traffic stream and which include:
   a. load factor
   b. peak hour factor
   c. metropolitan area population
   d. area characteristics

5. Specific traffic controls which include:
   a. marking of approach lanes
   b. traffic signal controls
   c. signal timing
   d. parking conditions
   e. one-way or two-way operations

The above list of factors affecting street capacity deficiencies is by no means exhaustive, but it serves as a basis of analysis of the deficiencies of the existing street system which will be discussed later.

EXISTING SYSTEM VOLUME/CAPACITY ANALYSIS

The discussion of the existing street system's volume-capacity ratio (v/c) is based upon the existing (1993) network capacity and the design year (2020) traffic volumes. This analysis indicates the status of the existing street network if no improvements are made to it. The v/c analysis points out those

areas of the network where capacity problems will occur. This allows the system planner to pinpoint problems and will serve as a guide in the development of alternative plans. Each alternative plan should be designed to alleviate expected capacity problems.

Volume-capacity ratio (v/c) is a measure of the traffic volume on a street segment compared to the capacity of that segment. A v/c ratio of 1.0 represents a facility with a volume of traffic equal to its vehicle-carrying capacity. A v/c ratio of greater than 1.0 denotes a facility with a volume of traffic greater than its capacity. The more the v/c ratio exceeds 1.0, the greater is the capacity deficiency.

The capacity deficiencies have been illustrated using three v/c ratio groups. The first group with v/c ratios of 0.01 to 0.89 represents those facilities well below capacity. The second group with v/c ratios of 0.90 to 0.99 represents those facilities approaching capacity. The third group with v/c ratios of 1.00 and up represents streets over capacity.

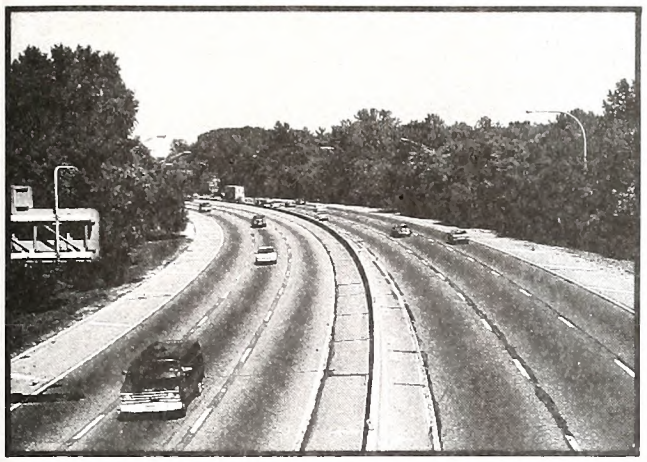
Figure 17 shows the capacity deficiencies that would occur if the design year traffic volumes (2020) were loaded onto the existing Siler City street network. Table 6 shows the locations with the highest number of accidents in Siler City from January 1989 through December 1993.

TABLE 6
SILER CITY 1989-1993 TRAFFIC ACCIDENT SUMMARY

LOCATION	NUMBER
US64 East Eleventh Street and SR1107 East Third St	30
US64 East Eleventh Street and SR2103 East Raleigh	25
SR1006 North Second Avenue and SR2100 Martin Luther	24
SR1006 North Second Avenue and SR1107 East Third St	24
SR1006 Second Avenue and SR2103 East Raleigh Street	23
US64 East Eleventh Street and SR2100 Martin Luther	17
SR2103 East Raleigh Street and Third Avenue	17
SR1108 North Chatham Avenue and Second Street	16
US64 East Eleventh Street and SR1317 Greensboro Ave	15
SR1107 Third Street and SR1108 North Chatham Avenue	15
SR1107 East Third Street and North Sixth Avenue	14
SR1006 West Raleigh Street and SR1108 Chatham Ave	13
SR2103 East Raleigh Street and Sixth Avenue	13
SR1006 North Second Avenue and East Seventh Street	12
SR1107 West Third Street and North Dogwood Avenue	11
SR1107 West Third Street and North Fir Avenue	11

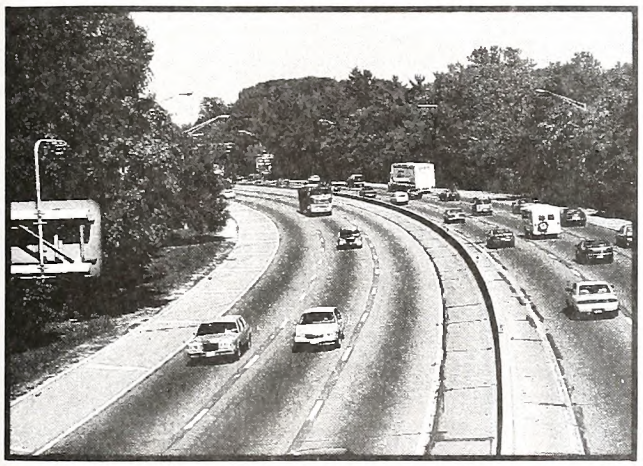
Reference 1: Transportation Research Board. Highway Capacity Manual. Special Report 209. Third Edition. Washington DC: National Academy Press, 1994, pages 1-3 to 1-4.
Reference 2: HCM, 1-4.

Source: 1994 Highway Capacity Manual



LOS A.

LOS D.



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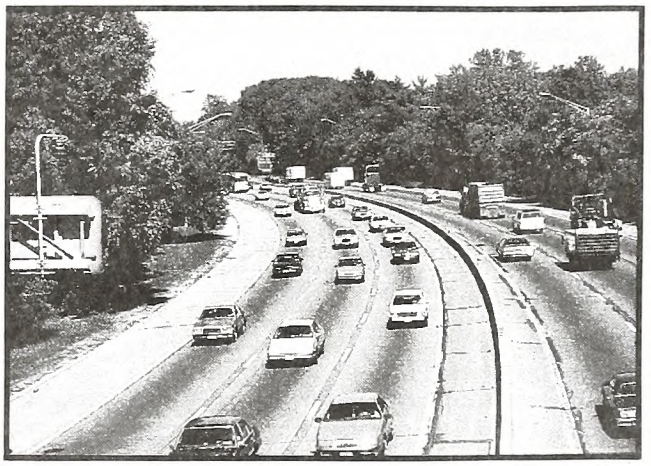

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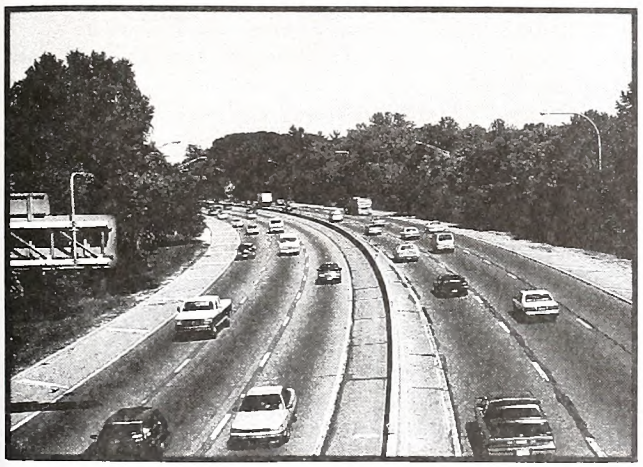
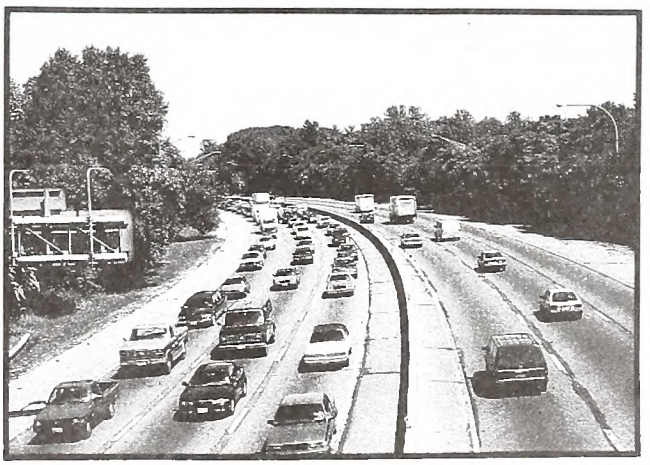


LOS C.



LOS F.

LEVELS OF SERVICE

FIGURE 16

SILER CITY EXISTING STREET NETWORK CAPACITY DEFICIENCIES IN DESIGN YEAR 2020

LEGEND

VOLUME – CAPACITY RATIO ≥ 1.0

FIGURE 17

TOWN OF SILER CITY

CHATHAM COUNTY NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 1 2

MILES

CHAPTER 5

ALTERNATIVES

The work performed for this Siler City Thoroughfare Plan is an update of the work done for the 1968 Plan. Various alternative thoroughfare plans are possible. These include the "do nothing" alternative, the old 1968 Plan, and the updated 1996 Plan. The new 1996 Plan is similar to the old 1968 Plan. The new US421 Freeway was constructed somewhat farther out than the old plan showed, and the Siler City Inner Loop was shifted somewhat to the East to correspond with recent planned development. The Airport Road Extension project (Project R-3325) has superseded the western side of the Siler City Inner Loop.

ALTERNATIVE 1: DO NOTHING OPTION

The "Do Nothing Option" consists of making no modifications to the street system in Siler City except for those projects which are already under construction. The "Do Nothing Option" has some major advantages which are listed below:

1. No capital investment cost.
2. No construction-related traffic disruption.
3. No noise, air, or water pollution due to construction.
4. No removal of shrubs or trees.
5. No additional land acquisition.
6. No displacement of people or businesses because of new construction.

The "Do Nothing Option" has several disadvantages which lead to severe adverse impacts upon the urban environment and are listed below:

1. Traffic volumes and congestion will increase on major streets which can cause traffic to divert onto residential streets.
2. Existing "bottleneck" situations will become worse.
3. Social, health, and safety standards will deteriorate.
4. Road use costs will increase.
5. Driving time will increase.
6. Traffic accidents will increase.
7. Traffic congestion will increase air and noise pollution.
8. Businesses will suffer increased transportation costs.
9. Emergency vehicles will have reduced mobility.
10. Retail sales will suffer as a result of increased congestion, reduced accessibility, and higher transportation costs.
11. Increased congestion will lead to higher driver and public frustration.

The "Do Nothing Option" would lead to some traffic problems as Figure 17 in Chapter 4 shows. Access into Siler City from US64 from both the east and west would become more difficult. SR1107 Third Street would suffer congestion also.

ALTERNATIVE 2: NON-CONSTRUCTION MEASURES

Improving operations and altering travel demand are non-construction measures for serving future traffic demands. Operational improvements include controlling access on thoroughfares, eliminating on-street parking, utilizing one-way traffic operations, installing reversible lanes, and improving traffic signal phasing and coordination. Travel demand alteration includes increasing vehicle occupancy rates and reducing peak hour loading. These measures could be achieved by staggering work hours, carpooling, and using mass transit. Other approaches are modifying land use development patterns and restricting urban growth. The applicability of these non-construction measures for Siler City is discussed below.

Control Of Access

Capacity deficiencies result primarily from inadequate street width. Appreciable increases in capacity could be achieved by installation of barrier medians or by purchase of access rights on abutting property. However, costs to do so are prohibitive, and political ramifications are too severe, in most cases, to make this approach realistic. Access control and barrier medians are of greater importance during construction of new facilities or major widening of existing facilities, and will receive consideration in construction alternatives analysis.

Parking Removal

As mentioned previously, capacity deficiencies result primarily from inadequate street widths. All future capacities were calculated on the basis of all pavement being available for use as traffic lanes, with no parking whatsoever. Some existing street deficiencies could possibly be remediated by eliminating on-street parking, but this approach would have no effect on projected future deficiencies.

One-Way Streets

Siler City currently has no one-way streets. The 1968 Thoroughfare Plan did not recommend conversion to or construction of any one-way facilities. Likewise, the 1996 Plan does not call for any one-way pairs. Even the grid system of streets in the central business district does not experience any operational problems that would suggest one-way pairs as a solution. Future conditions appear unlikely to change this.

Reversible Traffic Lanes

One way to increase a street's capacity is to alter the directional flow of traffic on one or more lanes so that a large number of lanes are provided for peak hour traffic. A directional split of at least two-to-one and preferably three-to-one should exist before a modification of this type is considered. None of Siler City's streets have directional splits of this magnitude. Also, most existing streets are not appropriate for this type of alteration. Most successful reversible lane operations take place in cities much larger than Siler City.

Traffic Signal Phasing And Coordination

The projected capacity deficiencies used in this study were determined by assuming that reasonable traffic signal phasing and coordination would be achieved. Signal phasing and coordination are particularly important along US64 Eleventh Street.

Transit, Ridesharing, Carpools, And Vanpools

One very certain method of decreasing traffic demand is to increase the number of persons per vehicle. However, the long-term trend has been in the opposite direction; vehicle occupancy rates across North Carolina have been moving downward over the last several decades.

Transit and ridesharing are heavily influenced by a number of factors including gasoline prices, parking availability, transit headways, and publicity campaigns. Siler City does not currently operate a fixed-route public transit system and appears unlikely to do so in the foreseeable future. With concentrations of industry along US64 Eleventh Street and SR1006 North Second Avenue, possibilities for ridesharing exist. However, the plausible increases in vehicle occupancy rates are insufficient to offset expected increases in population and vehicle usage.

Bicycles

The North Carolina Department of Transportation (NCDOT) has adopted a set of goals that encourages the planning, construction, and use of bicycle facilities. Increasing the use of bicycles, while a desirable part of a transportation plan, can at best play an extremely small role in the reduction of highway capacity deficiency problems. Siler City has no major areas likely to attain significant bicycle use in the future in great enough magnitude so as to serve as a meaningful transportation solution.

As part of a comprehensive bicycle route system for Chatham County, NCDOT has established two routes through Siler City. Route 4 begins at US64 Eleventh Street and proceeds southward

along SR1317 Greensboro Avenue and SR1006/SR2208 Second Avenue to SR2110 Alston Bridge Road. It continues eastward to SR2111 Old Plank Road and then follows it southward onto SR2114 Gees Grove Road to SR1176 Old US421 Road. Route 4 passes through Mount Vernon Springs and continues down through Bonlee. Route 5 begins at US64 Eleventh Street and proceeds northward on SR1317 Greensboro Avenue. It then follows SR1316 Harold Andrews Road to SR1004 Siler Mill Road, continuing northward on it to Crutchfield Crossroads. These routes are developed as part of project E-2910 and will be documented by a bicycle route map by the Office of Bicycle and Pedestrian Transportation.

Altering Work Hours

Changes in business and school employee hours, so that beginning and ending times for work are staggered, can reduce travel in the peak hour and thus increase the total travel-carrying ability of the street network. A campaign to encourage employers to adopt staggered work hours could be an effective method of further reducing peak hour travel. Some inconveniences to businesses and employers will be incurred with implementation of staggered work hours. Many business operations do not lend themselves to changes in work time for their employees. Altering work hours must be carefully arranged so as not to discourage the use of any planned transit or para-transit activities.

Altering Land Use Patterns

Land use has a direct and substantial effect on transportation demand. The land use plan and the thoroughfare plan should be consistent. Siler City is currently revising its comprehensive land use plan.

Growth Restrictions

"No growth" policies can slow the growth in travel and delay the need for street improvements. However, restrictions on growth could cause stagnation of the area's economic base. This approach appears inappropriate for Siler City.

ALTERNATIVE 3: COMMITTED PROJECTS

The 1998-2004 Transportation Improvement Program (TIP) contains several projects in the Siler City area. These projects include R-2610 to widen US421, R-2217 and R-2218 to widen US64, and R-3325 to extend SR1100 Airport Road. Together with the existing transportation network, these projects form the "existing plus committed" system. These projects will make major improvements in Siler City's roadway system, although a few problems would still remain. Figure 18 shows this situation.

ALTERNATIVE 4: THE 1968 PLAN

The initial modeling effort in the design year was directed towards analyzing the 1968 Thoroughfare Plan. The entire recommended 1968 Plan was coded into the model and retested. Figure 19 shows the 1968 Plan. The results of this retesting indicated that the 1968 Plan addressed the future highway needs relatively well. Certain fine-tuning adjustments to the basic 1968 Plan are in order, however. The major change would be the shifting of the US421 Bypass Freeway farther to the east, to reflect the actual construction thereof which was completed in 1990. However, some deficiencies exist, primarily on SR1107 Third Street. These are the same deficiencies as would result from Alternative 3 ("existing plus committed projects"), as the remaining projects identified on the 1968 Plan would not address those situations. Since it would have the same deficiencies as the Existing Plus Committed system, no separate figure is shown for 1968 Plan deficiencies.

The state-funded projects from the 1968 Plan that have been completed or are underway are shown in Table 7. No city-funded, completed projects have been identified.

TABLE 7
SILER CITY 1968 THOROUGHFARE PLAN ROAD PROJECTS COMPLETED/UNDERWAY

ROUTE	NUMBER	MILES	LOCATION	DESCRIPTION
US64	U-311	1.4	SR1108->SR1363	5-lane curb&gutter
US64	R-986	5.9	Randolph->SR1107	4R-reconstruction
US64	R-2218	10.2	US421->SR1514	4-lane divided
US64	R-3450	9.0	Randolph->WCL,etc	shoulder paving
US421	R-68	12.6	SR2210->Staley	4-lane freeway
SR1004	U-558C	0.4	US64->NCL	shoulder paving
SR1107	U-324B	0.5	CL->C&G section	shoulder paving
SR1107	U-324D	0.9	SR1006->US64	shoulder paving
SR1107	U-658P	1.1	SR1006->US64	shoulder paving
SR1108	U-324A	0.6	US64->NCL	shoulder paving
SR1317	U-324C	0.3	US64->NCL	shoulder paving
SR2100	U-46	0.6	SR1006->US64	3-lane curb&gutter
Sunview	C-14	0.8	SR1006->SR2113*	2-lane should&ditch

* Completed only half way.

ALTERNATIVE 5: THE RECOMMENDED PLAN

The recommended plan should meet all of Siler City's major transportation needs through the year 2020. This is the plan that was adopted by the Siler City Board of Commissioners and the North Carolina Board of Transportation. Figure 20 shows this thoroughfare plan as it was adopted.

SILER CITY

COMMITTED PROJECTS ONLY DEFICIENCIES IN DESIGN YEAR 2020

LEGEND

VOLUME - CAPACITY RATIO ≥ 1.0

FIGURE 18

TOWN OF SILER CITY

CHATHAM COUNTY NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 1 2
MILES

Thoroughfare Plan Cooperatively Developed by Community Planning Division, N.C. Department of Conservation & Development and Advance Planning Department, N.C. State Highway Commission.

FIGURE 19

THOROUGHFARE PLAN:

Adopted by Siler City on November 4, 1968

Recommended Approval by ADVANCE PLANNING DEPARTMENT on November 12, 1968

Adopted by NORTH CAROLINA STATE HIGHWAY COMMISSION on December 6, 1968

Public Hearing September 16, 1968

LEGEND

	Exist. Align.	New Align.
Major Thoroughfare		
Minor Thoroughfare		
Proposed Interchange	●	
Proposed Grade Separation	○	

NORTH

THOROUGHFARE PLAN

SILER CITY, N. C.

SEPTEMBER 23, 1968

0 800 1600

SCALE IN FEET

SILER CITY THOROUGHFARE PLAN

MAP DATE
MARCH 11, 1996

PUBLIC HEARING

ADOPTED BY: MARCH 18, 1996
TOWN OF SILER CITY

MARCH 18, 1996
RECOMMENDED BY:
STATEWIDE PLANNING BRANCH

ADOPTED BY: MARCH 26, 1996
N. C. DEPT OF TRANSPORTION

APRIL 12, 1996

LEGEND

	Existing	Proposed
Freeway/Expressway	———	— — —
Major Thoroughfare	———	— — —
Minor Thoroughfare	———	— — —
Interchange	●	◉
Grade Separation	○	◌

FIGURE 20

TOWN OF SILER CITY

CHATHAM COUNTY NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 1 2
MILES

CHAPTER 6

RECOMMENDATIONS

The project recommendations for specific roadways discussed here are also given in tabular form in Appendix G. Table 24 shows traffic volumes, cross sections, and right-of-way requirements for the relevant segments of roadway. References to project phase initiation dates are from the current Transportation Improvement Program.[1] While some thoroughfares are described herein as not requiring any major improvements by the design year, all roadways should be brought up to the standard width of 12-foot lanes if they are not already.

FREEWAY THOROUGHFARES

Freeway thoroughfares are special major thoroughfares. They are distinguished by full control of access as opposed to partial or no control of access on other major thoroughfares. Freeway major thoroughfares in North Carolina are found on all Interstate-numbered routes and some US-numbered routes.

US421 Freeway

The recently constructed new alignment for US421 was built as a freeway and replaced the old route through downtown Siler City, which has been redesignated as SR2113/SR1006. Project R-68 provided a four-lane with median section from north of SR2210 Carter Brooks Road to just north of US64, with a two-lane section proceeding northward into Randolph County. This northern two-lane section is now being supplemented by construction of the other two lanes also under Project R-68. US421 is part of the North Carolina Intrastate System, and NCDOT is upgrading this corridor to a complete multi-lane facility from Sanford to Greensboro. Project R-2610 will widen US421 southward towards Gulf, with construction currently scheduled for 2002. The traffic volumes on US421 around Siler City in the base year ranged from 5500 to 7800 and should be 12000 to 17000 in the design year. The four-lane median cross section passing by Siler City should be more than sufficient to handle this anticipated future traffic. The concept of a new alignment for US421 was shown on the 1968 Thoroughfare Plan, although the facility as constructed passed somewhat more to the east of Siler City than the old Plan showed. During the thoroughfare plan update work, possible interchanges at SR1316 Harold Andrews Road and SR2110 Alston Bridge Road were studied. However, these interchanges were not recommended due to the anticipated low levels of interchanging traffic and also the problems of meeting NCDOT's two-mile interchange spacing criteria for rural areas.

MAJOR THOROUGHFARES

Major thoroughfares typically serve through travel and external travel into major industrial, commercial, recreational, and institutional attractors. They may be either partial or no control of access and usually have little to no on-street parking. Major thoroughfares primarily carry intercity and intracity traffic and generally provide little land access. All US-numbered and NC-numbered routes are major thoroughfares, as well as some SR-numbered routes and municipally-maintained routes.

Airport Road (SR1100)

Airport Road carries traffic from southwest Chatham County into the western portion of Siler City. It also connects Siler City to Blair Municipal Airport. This existing two-lane facility will be extended from Third Street northward to Old US421 Road opposite Piney Grove Church Road under Project R-3325, following the recommendations of a 1995 feasibility study by NCDOT.[2] Work on the environmental document is scheduled to begin in 1997, with construction beginning in 2002. The existing roadway is only 20 feet wide and has several tight horizontal curves, which will also be addressed in the project. The extension will enable traffic from the Triad area to directly access Siler City's airport without having to go through town as is currently the case. The Siler City Planning Department has projected significant growth in industrial employment in the area around the airport.

Alston Bridge Road (SR2110)

Alston Bridge Road carries traffic from central Chatham County into southeastern Siler City. The existing roadway passes through lightly developed residential areas and past the Siler City recreation complex. The Siler City Planning Department has projected significant growth in housing in the area south of US64 and north of Alston Bridge Road. If this development takes place as anticipated, the 2600 vehicles per day in the base year should increased to 3700 vehicles per day in 2020. This higher level will still be somewhat below capacity, so widening to multilane cross section has not been recommended. Alston Bridge Road will be intersected by the proposed Inner Loop.

Bish Road (SR1105)

Bish Road carries traffic from the residential and agricultural areas west of Siler City to SR1006 Old US421N Road. It has an existing at-grade crossing of the Norfolk Southern track, and it would become the northern-most component of the Western Circumferential. Bish Road should carry 1200 vehicles per day in the design year, and no major improvements are recommended.

Bish-Stockyard Connector

The Bish-Stockyard Connector would improve access between the existing SR1106 Stockyard Road and SR1105 Bish Road and would improve travel efficiency as part of the Western Circumferential. It should be constructed as a two-lane shoulder-and-ditch section roadway and would carry 800 vehicles per day in the design year.

Brower Road (SR1120)

Brower Road is currently a short looping roadway that intersects SR1100 Airport Road twice. The southern portion should be extended northwestward to tie into SR1102 Coleridge Road as part of the Western Circumferential. This section should carry 1400 vehicles per day in 2020.

Brower-Paschal Connector

This proposed section of major thoroughfare would be a component of the Western Circumferential that would fill the gap between SR1119 Wade Paschal Road and SR1120 Brower Road. As an intermediate measure, traffic could use SR1121 Edwards Road until the Connector was completed. The new roadway would carry 1300 vehicles per day in 2020.

South Chatham Avenue Extension (SR2113)

South Chatham Avenue Extension is the old alignment of the US421 route. It now connects southern Siler City to the new US421 facility via its interchange east of Gees Grove Road. South Chatham Avenue is a four-lane divided facility from the new US421 freeway to the southern town limits of Siler City. Thereafter, it continues northward as a four-lane curb-and-gutter roadway. The SR2113 routing continues on north of South Chatham Avenue as Fayetteville Avenue. Since the completion of the new US421 in 1990, traffic volumes on South Chatham Street have dropped substantially. No significant improvements are recommended.

Coleridge Road (SR1102)

Coleridge Road connects western Chatham County to Siler City via Third Street. Development along it is mostly low density residential and agricultural in nature. Base year traffic was 1000 vehicles per day with design year traffic of 1500 vehicles per day. This roadway should be extended to the north from Third Street to tie into the upper portion of Ellington Road. This extension, in addition to a short section of the roadway just south of Third Street, would be incorporated into the Western Circumferential.

College Street

College Street is currently a relatively minor street linking SR2113 South Chatham Avenue to SR2208 South Second Avenue. However, it will be extended eastward to SR2110 Alston Bridge Road to become part of the Inner Loop. College Street should carry 4000 vehicles per day in the design year. The 1968 Thoroughfare Plan proposed the use of the parallel Hillbrook Boulevard, but College Street is straighter and flatter, and the Siler City Board of Commissioners preferred it over Hillbrook for the purpose of continuing the Inner Loop.

Dogwood Avenue

Dogwood Avenue is an existing north-south roadway through primarily residential areas on the west side of the densely developed area of Siler City. It should be extended northward from US64 Eleventh Street to intersect SR1108 Chatham Avenue just east of Siler Street. It should also be extended to the south to intersect the proposed Sunview Drive Extension (part of the Inner Loop) in the vicinity of SR1189 Pine Forest Drive. These extensions would complete a major north-south corridor that would serve as an alternative to Second Avenue which passes through more commercially developed and congested area of Siler City. Traffic volumes on Dogwood Avenue would vary from 1200 to 3600 vehicles per day in the design year.

Eleventh Street (US64)

US64 is a principal arterial passing through central North Carolina and connects Asheboro, Ramseur, Siler City, and Pittsboro to Raleigh. Base year traffic ranged from 6000 vehicles per day on the western section to 13900 near US 421. Design year traffic should reach a maximum of 24000 vehicles per day in the vicinity of the Siler Crossing Shopping Center. This existing facility is a five-lane uncontrolled access highway through most of Siler City and a two-lane roadway to the west of SR1108 Chatham Street and to the east of SR1363 Pearlyman Teague Road. As part of a series of improvements to the North Carolina Intrastate System, it will be widened to a four-lane roadway from Ramseur to Siler City under Project R-2217, with construction scheduled to begin in 1999. It will also be widened to a four-lane roaway from Siler City to Pittsboro under Project R-2218 and Project R-2219 which are already in progress. One alternative considered was a potential US64 bypass facility; however, the projected design year traffic volumes on the existing facility did not justify such a project. This mirrors the conclusion previously reached by NCDOT following a corridor study of US64 from Lexington to Raleigh.[3] Strip commercial development along US64 in Siler City has been substantial and will probably continue to increase in the future. Asheboro provides an illuminating example of this phenomenon. Good local development planning, especially in terms of driveway

access control, will be important in maintaining the efficient functioning of this roadway.

Ellington Road (SR1106)

A short segment of the northern part of Ellington Road will supply a piece of the future Western Circumferential. This segment intersects US64 opposite Stockyard Road, an existing and squared-up four-way intersection. With 500 vehicles per day anticipated in the design year, the existing two-lane cross section should be adequate.

Gees Grove Road (SR2114)

Gees Grove Road is an existing rural roadway that would complete a corridor around the southern portion of the Siler City study area. It intersects SR2113 South Chatham Avenue just to the west of the interchange with the new US421. Gees Grove Road also serves as a component of Route 4 of the Chatham County bicycle route system.

Hamp Stone Road (SR1108)

Hamp Stone Road provides an alternative route to SR1006 Old US421 Road for reaching the northern industrial area of Siler City. It has some recent residential and institutional development along it, and it has an at-grade crossing over the Norfolk Southern railroad track. Projected 2020 traffic volumes should not exeeced 4000 vehicles per day; therefore, no major improvements are recommended.

Inner Loop

The Inner Loop concept first appeared on Siler City's 1968 thoroughfare plan. It has been modified by shifting some of it eastward so as to be coordinated with planned residential development south of Eleventh Street. It has also been extended northward across US64 to tie into SR1326 Richardson Road and then westward across SR1004 Siler Mill Road to SR1006 Old US421 Road. The Inner Loop will give Siler City a looping facility that will encircle most of the currently well-developed land area of the municipality. It will significantly improve travel from the northern to the southwestern areas and vice versa. A major segment of the Inner Loop south of Eleventh Street will be provided by Poney Farm Road which will be a developer-constructed roadway that will be part of the Autumn Estates residential development.

Martin Luther King Junior Boulevard (SR2100/SR1004)

As Siler City Snow Camp Road (Siler Mill Road), this facility brings traffic from the outlying residential and agricultural areas of northern Chatham County into Siler City. The primary trip attractor along it is the Chatham Middle School. Traffic volumes were 2000 vehicles per day or less in the base year; design year volumes should peak at 12000 near SR1006 North Second Avenue. This facility has been improved by widening to a three-lane curb-and-gutter cross section from North Second Avenue to Eleventh Street. As the design year traffic projections should be well within its capacity, no further improvements are recommended.

Oakley Church Road (SR1130)

Oakley Church Road is currently a minor rural roadway running east-west across the southern-most portion of the Siler City study area. It should be extended eastward to intersect SR1176 Old US421 Road opposite SR2114 Gees Grove Road so as to complete a southern circumferential system consisting of SR1100 Airport Road, Oakley Church Road, and Gees Grove Road. The Siler City Planning Department has projected significant growth in industrial employment in the southwestern portion of the study area around the Blair Municipal Airport. If that growth occurs as anticipated, the Oakley Road Extension would provide access between this area and the new US421 at the SR2113 Sam Fields Road interchange. The extension would have to cross the Southern Norfolk railroad track which parallels Old US421 Road.

Old US421 Road (SR1176)

Old US421 Road brings traffic into Siler City from the residential areas to the south. It still has some industrial land use along it as it comes up from the Mount Vernon Springs and Bonlee communities. It parallels the Norfolk Southern railroad track headed northward into Siler City. It also carries Route 4 of the Chatham County bicycle route system south of SR2114 Gees Grove Road.

Park Drive (SR1115)

This short, existing residential street will become another link in the Inner Loop. It should be upgraded and extended southeastward to intersect SR1006 West Raleigh Street opposite Sunview Drive. It is expected to carry 6000 vehicles per day in the design year.

Piney Grove Church Road (SR1362)

Piney Grove Church Road has become an important roadway for Siler City with the construction of an interchange with the new alignment of US421, one of three interchanges in the area. Design year traffic should be 4100 vehicles per day. The Airport Road extension project (Project R-3325) will incorporate Piney Grove Church Road and make some improvements to it as part of the goal of upgrading access to the Blair Municipal Airport.

Poney Farm Road

Poney Farm Road is a planned roadway that would begin at Wayne Drive and proceed southward through the platted Autumn Estates Housing Development, a residential subdivision south of US64 Eleventh Street. The Town of Siler City coordinated developer activity with the updated thoroughfare plan concept of the Inner Loop so as to provide another segment thereof.

Raleigh Street (SR1006/SR2103)

West Raleigh Street (SR1006) serves the commercially developed area of southwest Siler City and brings in traffic from Goldston and southwest Chatham County. East Raleigh Street (SR2103) connects the downtown area to east US64 and provides a primary route for traffic headed to Jordan-Matthews High School. It currently carries up to 6000 vehicles per day in the vicinity of Third St. and should see up to 7800 in the design year. From Third St. out to Eleventh Street, volumes will be approaching capacity and a three lane section is recommended. The two lanes from Dogwood to Third St. should also be converted to three lanes.

Richardson Road (SR1384)

Richardson Road is an existing residential street that should be extended westward from SR1004 Siler Mill Road, across SR1316 Harold Andrews Road, to SR1006 Old US421 Road. It should carry from 3000 to 5000 vehicles per day in the design year.

Sam Fields Road (SR2113)

Sam Fields Road is a two-lane shoulder-and-ditch roadway that moves traffic between SR2110 Alston Bridge Road in the east and the US421 Freeway on the west, having a full interchange with the US421 facility. It becomes South Chatham Avenue Extension as it continues on into Siler City. With 5100 vehicles per day projected for the design year, no major improvements are recommended.

North Second Avenue (SR1006)

North Second Avenue is the old route of US421 through Siler City. It is currently a four-lane curb-and-gutter facility with some left-turn lanes at signalized intersections south of Greensboro Avenue and a two-lane shoulder-and-ditch section north of it. North Second Avenue serves the east side of Siler City's central business district and the well-developed commercial areas along its route. North of Eleventh Street, it serves some industrial development. With the relocation of the US421 route to a new alignment, North Second Avenue should not require any major improvements through the design year.

South Second Avenue (SR2113/SR2208)

South Second Avenue covers both a section of the old US421 routing north of Fayetteville Avenue and a branching major thoroughfare that connects to Alston Bridge Road. Second Avenue is a primary route through Siler City and moves traffic to the extensive commercial development along its path on the east side of the central business district. The old US421 segment is a four-lane curb-and-gutter cross section, and the southeasterly branch is a two-lane shoulder-and-ditch section. Design year volumes are anticipated at 8900 vehicles per day on the old US421 segment and 1000 on the SR2208 segment. The existing cross sections should be sufficient for future traffic volumes.

Sunview Drive

Sunview Drive is currently a short, dead-end residential street that intersects SR1006 West Raleigh Street. It should be upgraded and extended eastward to intersect SR2113 South Chatham Avenue opposite College Street. This extension would complete another segment of the Inner Loop. This segment should carry 7000 vehicles per day in the design year.

Third Street (SR1107)

Third Street is the old route of US64 prior to the construction and later widening of Eleventh Street. It provides direct access to the downtown area from US64 on both the east and west approaches to Siler City. It also serves substantial commercial development along its path, especially on the eastern half. Base year traffic volumes peak on the section from North Holly St. to North Sixth St. at 6600 vehicles per day. This same section should see 8000-16000 vehicles per day in 2020. Third Street is currently a two-lane shoulder-and-ditch facility from US64 (west) to North Holly St. and from North Second Avenue to US64 (east), with a curb-and-gutter section in between. The existing two-lane roadway will need to be widened to handle the anticipated daily volumes from North Second to North Sixth.

Also, while not required by a capacity deficiency, the section from Airport Road eastward to US 64 should be considered for widening, as this section will almost reach capacity in the design year, and little extra traffic growth would be required to lead to a capacity problem. Due to the constricted right-of-way and close-in development, the section from North Sixth to US 64 would have significant adverse impacts during a widening project. An alternative for the Third Street widening project is to do nothing; however, this option would not provide a satisfactory level of service in the design year, and is therefore not recommended.

Wade Paschal Road (SR1119)

Wade Paschal Road is currently a very narrow and low-volume roadway on the southern periphery of Siler City. The northeastern portion of the roadway will be incorporated into the Western Circumferential to complete the SR1006 Siler City Glendon Road to SR1006 Old US421 Road corridor. The 2020 traffic on this segment of roadway should be 1800 vehicles per day.

Wayne Drive

Wayne Drive is an existing gravel street south of US64 Eleventh Street. It should be paved and also extended north from US64 to meet the existing SR1384 Richardson Road. It is anticipated to carry 5000 vehicles per day in the design year. Poney Farm Road will connect to it from the south to complete another segment of the Inner Loop.

Western Circumferential

The Western Circumferential facility is a set of existing roadways and proposed extensions that would complete a semi-looping roadway around the west side of the Siler City study area, somewhat similar to the new US421 freeway around the east side, except not as a controlled-access roadway. The Western Circumferential would improve the efficiency of travel from the residential areas of southern Siler City to the industrial areas along SR1006 Old US421N Road. The existing or proposed roadways that would be part of the Circumferential are: SR1119 Wade Paschal Road, Brower-Paschal Connector, SR1120 Brower Road, Brower Road Extension, SR1102 Coleridge Road, Coleridge Road Extension, SR1106 Ellington Road, SR1106 Stockyard Road, Bish-Stockyard Connector, and SR1105 Bish Road.

MINOR THOROUGHFARES

Minor thoroughfares typically serve internal travel within the urban area. They normally have no control of access and often have on-street parking. Minor thoroughfares primarily carry only intracity traffic and generally provide significant land access, as well as carrying traffic already on local streets to major thoroughfares. Minor thoroughfares are normally SR-numbered routes and municipally-maintained routes.

Chatham Avenue (SR1108)

Chatham Avenue passes through the center of Siler City's central business district. It collects traffic from the local commercial streets and moves it to and from the major thoroughfares, such as Raleigh Street and Third Street. No major improvements are recommended. Widening of Chatham Avenue would be extremely difficult throughout most of its length due to the close proximity of the adjoining commercial and residential structures. Any improvement in capacity would most likely have to come from the elimination of on-street parking and use of the freed-up pavement for travel lanes.

Driftwood Drive (SR1184)

Driftwood Drive is currently a lesser residential collector street on the west side of Siler City. It should be extended westward to intersect SR1106 Ellington Road north of the Chatham Elementary School. In conjunction with a connection of the two parts of West Ninth Street, this extension will complete a minor thoroughfare corridor that will provide improved access to Siler City's western residential areas to both SR1106 Ellington Road (part of the Western Circumferential) and Dogwood Avenue. Base year traffic of 443 vehicles per day should increase to 800 vehicles per day in the design year.

Elk Street

Elk Street is a minor east-west roadway on the current southern edge of Siler City's well-developed central core. West Elk Street has an at-grade crossing of the Norfolk Southern railroad track. It should be extended eastward across Fayetteville Street (SR2113) to connect to East Elk Street at its intersection with South Second Avenue (SR2208). This would complete a southside cross-town roadway for Siler City, and 1500 vehicles per day should utilize it in the design year.

Ellington Road (SR1106)

A short segment in the middle part of Ellington Road will serve as the continuation of the SR1184 Driftwood Road extension. This minor thoroughfare corridor will enable traffic to move east and west from the residential areas of western Siler City. The entire corridor will extend from Ellington Road on the west at the intersection of the proposed Coleridge Road extension to Dogwood Avenue on the east. Eight hundred vehicles per day are anticipated in the design year on the subject section of Ellington Road.

Fifth Street

Fifth Street serves as an alternative to SR1107 Third Street for east-west travel through the densely developed area of central Siler City. It also possesses one of the relatively few crossings of the Norfolk Southern railroad track. Fifth Street should be extended from Carolina Avenue to the west to intersect SR1107 Third Street opposite SR1115 Park (Sunset) Drive. This extension would complete the alternative east-west corridor from Third Street on the west to SR1006 North Second Avenue in the center of Siler City. Base year traffic on the facility was 2091 vehicles per day with 3500 projected for the design year with 2700 on the extension portion.

Greensboro Avenue (SR1317)

Greensboro Avenue provides access to the adjoining commercial development. It formerly provided the opportunity for through traffic on the old US421 alignment (now SR1006) to interchange with US64 Eleventh Street. Projected future traffic is 5800 vehicles per day, and its two-lane cross section should be adequate through the design year. It carries Route 5 of the Chatham County bicycle route system from SR1006 North Second Avenue to SR1316 Harold Andrews Road.

Harold Andrews Road (SR1316)

Harold Andrews Road provides an alternative route into Siler City for traffic coming in on the SR1004 Siler Mill Road corridor. It has some minor residential development along it, and it carries Route 5 of the Chatham County bicycle routes system. With 2200 vehicles per day anticipated in the design year, no major improvements are recommended.

West Ninth Street

West Ninth Street currently serves as a local residential street. It should be extended one block to the west so as to tie into Driftwood Drive (SR1184) at its intersection with North

Garden Avenue. This would complete the minor thoroughfare corridor composed of Ellington Road (SR1106), Driftwood Drive (SR1184) and West Ninth Street. Extension of West Ninth Street to the east is not recommended as this would create another at-grade crossing of the Norfolk Southern railroad track.

South Second Avenue (SR2208)

South Second Avenue is currently a low-volume roadway that serves to carry traffic from the residential areas along it up into Siler City. The planned new middle school in the vicinity of College Street will somewhat increase the importance of this facility. The design year should see 1000 vehicles per day, and no major improvements are recommended. However, widening to 24 feet is strongly recommended especially north of College Street. From an operational standpoint, turn lanes may be needed in the future at locations such as SR2110 Alston Bridge Road or the Inner Loop, particularly after the completion of the middle school.

PROJECT PRIORITIES

Table 8 lists all recommended projects for Siler City in priority groupings. Group A projects are those that are currently funded in the Transportation Improvement Program. Group B projects are those that are not currently funded but have high value and importance for the Town and should be concentrated upon during discussions amongst local officials and during presentations of needs to the Board of Transportation. Group C projects are those projects that have moderate priority for the Town. Group D projects have low priority or constitute very long-range needs. Projects on the North Carolina Intrastate System are marked with an asterisk (*). Projects that are part of the Siler City Inner Loop are marked with a double-asterisk (**). Projects that are part of the Western Circumferential are marked with a triple-asterisk (***).

TABLE 8
SILER CITY PROJECT PRIORITY GROUPS

GROUP	MAP	NAME	TIP NUMBER
A	1	US64 Highway West Widening	R-2217 *
	2	US64 Highway East Widening	R-2218 *
	3	SR1100 Airport Road Extension	R-3325
B	4	Wayne Drive Upgrade	R-3617**
	5	Poney Farm Road Construction	R-3617**
	6	College Street Extension	R-3617**
	7	College Street Upgrade	R-3617**
	8	Sunview Drive Extension	-- **
	9	Sunview Drive Upgrade	-- **
	10	Park Drive Extension	-- **
	11	Park Drive Upgrade	-- **
C	12	East Third Street Widening	--
	13	West Ninth Street Extension	--
	14	Driftwood Road Extension	--
	15	West Fifth Street Extension	--
	16	Glenn Avenue Extension	--
	17	North Sixth Avenue Extension	--
	18	North Dogwood Avenue Extension	
	19	South Dogwood Avenue Extension	
D	20	Bish-Stockyard Connector Construct	-- ***
	21	Coleridge Road Extension	-- ***
	22	Brower Road Extension	-- ***
	23	Brower-Paschal Connector Construct	-- ***
	24	East Sears Street Extension	--
	25	West Sears Street Extension	--
	26	Richardson-Wayne Connector	-- **
	27	Richardson Road Extension	-- **
	28	Oakley Church Road Extension	--
	29	Elk Street Extension	--

* North Carolina Intrastate System
** Siler City Inner Loop
*** Western Circumferential

Reference 1: North Carolina Department of Transportation. Transportation Improvement Program - 1998-2004. NCDOT, 1997.

Reference 2: North Carolina Department of Transportation, Division of Highways, Program Development Branch. "Feasibility Study: Siler City, Airport Access Improvements, From Siler City Municipal Airport to US421, Chatham County, R-3325." Raleigh, March 1995.

Reference 3: North Carolina Department of Transportation, Division of Highways, Planning and Research Branch. US64: A Corridor Study, Lexington to Raleigh. Raleigh: NCDOT, 1990.

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CHAPTER 7

IMPACTS

The major proposed projects described in Chapter 6 have been analyzed for their impacts upon the natural and social environment around Siler City. These impacts, both positive and negative, are discussed below and are also listed in tabular form in Table 9.

BENEFITS

The benefits of each project have been estimated based upon vehicle operating cost savings, travel time cost savings, and accident cost savings over a 20-year period. This analysis has been performed using Transportation Project Evaluation Using The Benefits Matrix Model.[1] Benefits are expressed in terms of 1997 dollars.

COSTS

The costs of each project have been estimated based upon statewide average values and are separated into right-of-way (R) and construction (C) components. Where right-of-way is dedicated by developers, the cost of a project would decrease by the corresponding amount. These estimates have been derived using the Statewide Planning Branch in-house cost estimation spreadsheets. Costs are expressed in terms of 1997 dollars.

ECONOMIC IMPACTS

The economic impact of a project is defined as the potential to stimulate economic development in the immediate area of the project and is expressed on a scale of 0.0 for least likely to +1.0 for most likely. Projects that serve areas of industrial and commercial land uses are more likely to have greater economic development potential than projects that serve residential and agricultural land uses.

ENVIRONMENTAL IMPACTS

The environmental impact of a project is its potential to change the natural, physical, and social environment in the vicinity of the project and may be positive or negative. It is expressed on a scale of 0.0 for least likely to +1.0 for most likely for positive impacts and 0.0 for least likely to -1.0 for most likely for negative impacts. The environmental factors considered are: air quality, water resources, soil and geology, wildlife, vegetation, neighborhoods, noise, education facilities, churches, park and recreational facilities, historic sites and landmarks, public health and safety, and aesthetics.

Map overlays prepared by the Center for Geographic Information and Analysis provided the material for reviewing known environmental concerns in the study area. These map overlays covered water zones, watersheds, trout streams, and spawning areas (base); threatened and endangered species occurrences, parks, and natural and recreation areas (overlay 1); hydric soils, submersed rooted vasculars, and wetlands (overlay 2); superfund sites, landfills, and groundwater incidents (overlay 3); and archaeological sites and National Register sites (overlay 4). Coverage included the Coleridge, Crutchfield Crossroads, Liberty, and Siler City quadrangles of the United States Geological Survey's 7.5 minute series topographic maps. This review did not uncover any likely impacts to known sites by the proposed projects recommended in this report.

TABLE 9
SILER CITY BENEFITS AND COSTS

PROJECT /MILE	BENEFITS $1000	COSTS	$1000
Bish-Stockyard Connector	2,159	R	112
0.4 miles / 0.7 km		C	840
Brower Road Extension	2,315	R	137
0.7 miles / 1.1 km		C	1,555
Brower-Paschal Connector	2,987	R	276
0.4 miles / 0.7 km		C	840
Coleridge Road Extension	6,999	R	103
0.5 miles / 0.8 km		C	1,134
College Street Extension	15,252	R	260
1.6 miles / 2.6 km		C	1,344
(includes Pony Farm & Wayne Drive)			
Dogwood Ave. Extensions	9,509	R	160
0.7 miles / 1.1 km		C	1,470
Driftwood Road Extension	1,845	R	185
0.6 miles / 1.0 km		C	1,344
(includes W. Ninth & Ext)			
Elk Street Extension	6,429	R	361
0.1 miles / 0.2 km		C	210
West Fifth Street Exten	103,143	R	209
0.1 miles / 0.2 km		C	210

TABLE 9 (continued)
SILER CITY BENEFITS AND COSTS

PROJECT	BENEFITS /MILE $1000	COSTS $1000
Glenn Avenue Extensions	3,144	R 311
0.4 miles / 0.6 km		C 840
West Ninth Street Exten.	See	R 312
0.1 miles / 0.2 km	Driftwd.	C 210
Oakley Church Rd. Exten.	8,262	R 202
1.9 miles / 3.1 km		C 4,075
Park Drive Extension	4,838	R 337
0.7 miles / 1.1 km		C 1,555
Pony Farm Road Construct	See	R 129
0.9 miles / 1.5 km	College	C 1,975
Richardson Road Extension	22,267	R 359
0.9 miles / 1.5 km		C 1,975
Richardson-Wayne Connector	20,227	R 264
0.6 miles / 1.0 km		C 1,344
Sears Street Extensions	9,406	R 484
0.4 miles / 0.6 km		C 840
Third Street Widening	3,509	R 500
2.6 miles / 4.2 km		C 4,344
North Sixth Avenue Exten	216,775	R 411
0.1 miles / 0.2 km		C 210
Sunview Drive Extension	62,658	R 129
0.5 miles / 0.8 km		C 1,050
Wayne Drive Upgrade	See	R 169
0.1 miles / 0.2 km	College	C 210

NOTE: Programmed projects are not included in this table, and only projects involving pavement on new location or addition of travel lanes have been included. The several projects consisting of upgrades to existing roadways (such as paved shoulders or wider travel lanes) have been excluded.

Reference 1: North Carolina Department of Transportation, Division of Highways, Planning and Research Branch. Transportation Project Evaluation Using The Benefits Matrix Model. Technical Report 8. Raleigh: NCDOT, January 1983. See also "Benefits Matrix Model Cost Update: Second Supplement to Technical

"Benefits Matrix Model Cost Update: Second Supplement to Technical Report 8" of September 1988.

CHAPTER 8

IMPLEMENTATION

The Town of Siler City and the State of North Carolina have joint responsibility for the implementation of the Siler City Thoroughfare Plan. North Carolina General Statute 136-66.1 specifies which elements of a plan are a State responsibility and which are a Town responsibility. In general, the State is responsible for those facilities which will serve major volumes of through traffic and external traffic proceeding inward to major commercial, industrial, and institutional areas within the municipality. The Town is responsible for those facilities which serve primarily internal travel. The Town will share a portion of the right-of-way cost on projects constructed by the State depending upon the degree of benefits to the municipality.

The recommended construction improvements in the Siler City Thoroughfare Plan will cost millions of dollars. Table 24 in Appendix G summarizes information on these improvements in tabular form. Declining gasoline tax revenues and increasing road construction costs have greatly reduced the ability of the State to fund improvements. North Carolina's highway needs for the years 1990 through 2000 total approximately $16 billion.[1] Transportation needs far outweigh the available funding. The State and the Federal government are relying increasingly on municipal and private funding.

Initiative for plan implementation rests largely with the Town of Siler City. Implementation of the plan will not be easy. The Town may use a number of procedures, resources, and tools to aid in plan implementation. These include developer dedication and construction, Town funding, federal revenue sharing or block grants, urban bonds, urban redevelopment programs, municipal service districts, zoning ordinances, subdivision ordinances, future street line ordinances, advance purchase of right-of-way, and lobbying for State construction of needed facilities which are State responsibility. Effective and continuing use of available resources, tools, and programs over an extended period of time will result in the recommended projects being developed.

A number of the administrative tools and procedures recommended for project implementation may be appropriate for Siler City. Many of these may be used effectively to make improvements to other elements of the street system which would be desirable but which are not identified as specific needs. A discussion of these tools and procedures is given below.

SUBDIVISION CONTROL

A subdivision ordinance requires that every developer submit

a plat of his proposed subdivision to the Planning Board for review and approval. Certain standards must be met by the developer before he can receive permission to construct his development. Through this process, the necessary right-of-way for streets which are part of the thoroughfare plan may be obtained or protected from development. Street construction in accordance with the plan can be required of the developer.

Appendix B gives recommended definitions and design standards for subdivision ordinances. Siler City currently has extraterritorial jurisdiction for zoning and planning. A review of Siler City's present ordinances to insure that they are compatible with the thoroughfare plan is desirable.

OFFICIAL STREET MAP

A municipality may, through special enabling legislation, adopt an official street map which indicates both existing and future street lines. No new construction or reconstruction of structures is permitted within the designated future street lines. This has over a period of time reduced the cost of additional right-of-way along densely developed thoroughfares which have required widening.

House Bill 1211 enables Siler City to protect and acquire right-of-way outside its corporate limits for street or sidewalk construction since this thoroughfare plan has been mutually adopted by the Town of Siler City and the State of North Carolina. If Siler City funds acquisition of right-of-way for a State highway system street improvement project, the North Carolina Department of Transportation may reimburse the Town in whole or in part for expenditures made by the Town to acquire or fund the acquisition of right-of-way.

FUTURE STREET LINE ORDINANCE

This ordinance is of particular benefit where widening of a street will be necessary at some time in the future. A municipality, with legislative approval, may amend its charter to be empowered to adopt future street line ordinances. Through a metes-and-bounds description of a street's future right-of-way requirements, the Town may prohibit new construction or reconstruction of existing structures within the future right-of-way. This approach requires a specific design for the facility and normally requires property surveys and public hearings to allow affected land owners to know what is proposed and to make appropriate adjustments without undue hardships.

ZONING

Zoning ordinances are beneficial to thoroughfare planning in that planned locations of various land uses and their densities

can be achieved. This provides some stability upon which to base travel forecasts and to plan street development.

Other benefits include the establishment of standards for development which will facilitate smooth traffic operations on thoroughfares, the minimization of strip commercial development which creates traffic friction and traffic accident potential, and the requirement for off-street parking in new development with the intention of ultimately prohibiting curb parking on all major thoroughfares.

REDEVELOPMENT

Redevelopment is the term used to describe efforts toward the removal or rehabilitation of undesirable development. It is one of the few tools available to correct basic mistakes in the street system, such as poor design, poor layout, and too many streets. Redevelopment opportunities generally occur in older areas of cities.

MUNICIPAL SERVICE DISTRICTS

Under North Carolina General Statute, Chapter 160A, Sections 535-543, the legislative body of a municipality may create one or more municipal service districts in a downtown commercial area in order to raise additional funds for physical improvements. One purpose of the district could be to facilitate traffic flow and parking. The district may issue bonds which would be paid off with revenues from an extra ad valorem tax on all property within the district's boundaries. Once the improvements are completed and the bonds are retired, the extra taxation would cease and the district would be dissolved.

CAPITAL IMPROVEMENTS PROGRAM

Another tool for building the thoroughfare system is the capital improvements program. This is a long-range plan for spending money on street improvements, right-of-way acquisition, and other capital improvements, within the bounds of projected revenues. The Town will need funds for the construction of streets which are municipal responsibilities, for the sharing of costs of right-of-way of streets which are State responsibilities, and for the advance purchasing of right-of-way for future roadways where appropriate.

Table 9 shows the cost estimates for the recommended projects. These estimates are preliminary and are based upon general statewide averages of construction costs. The final costs of projects may be significantly higher or lower. Right-of-way costs could be minimized by exercising the planning controls previously described and by selectively advance purchasing right-

of-way as opportunities occur.

DEVELOPMENT REVIEWS

Requests for driveway access to state-maintained roadways are reviewed by the District Engineer's Office of the North Carolina Department of Transportation prior to approval being granted, as prescribed by North Carolina General Statute 136-93. Any development expected to generate large volumes of traffic, such as shopping centers, large industries, and so forth, may be comprehensively studied by a review team of staff personnel from Traffic Engineering Branch, Statewide Planning Branch, and Highway Design Branch. If this review occurs early in the development's design, access may often be improved with minimal expense. Since the Town is often the first point of contact for developers, the Town should advise them of this requirement and assist in the review.

IMPACT FEES

Municipalities may levy impact fees on new development to pay for the appropriate portion of off-site infrastructure improvements made necessary as a result of that development. A municipality seeking to impose impact fees must receive that authority from the state legislature.

STATE FUNDING SOURCES

The North Carolina Department of Transportation has several sources for funding highway improvements. The Transportation Improvement Program (TIP) funds major projects of statewide significance. The Secondary Road Improvement Program (SRIP) primarily funds paving of unpaved state-maintained secondary roads, but also may have additional monies for improvements to existing paved roads for safety and maintenance purposes. The Small Urban Fund (SUF) provides monies for low-cost urban projects which may not be addressed by the TIP. The Industrial Access Fund (IAF) can assist municipalities in attracting new industries by providing for access to existing state-maintained roadways.

Reference 1: North Carolina Department of Transportation. Transportation Improvement Program - 1991-1997. Raleigh: NCDOT, 1990, page HP-1.

APPENDIX A

PEDESTRIAN POLICY GUIDELINES
4-20-94

EXECUTIVE SUMMARY

These guidelines provide a procedure for implementing the Pedestrian Policy adopted by the Board of Transportation in August 1993. The Pedestrian Policy addresses TIP projects and makes an important distinction between "considering the needs of pedestrians to avoid creating hazards to pedestrian movements" and the concept of "facilitating pedestrian movements for other reasons."

HAZARDS

A hazard in this context is defined as a situation when pedestrian movements are physically blocked in a manner which forces pedestrians to use another mode of transportation or walk in an automobile traffic lane (parallel with the automobile traffic) to pass a barrier. The concept of "not creating a hazard" is intended to allow municipalities to have the flexibility to add pedestrian facilities as part of the project, or in the future after the TIP project is complete. Our current standard cross sections generally do not create barriers for pedestrian movements. One exception is on urban bridges where the bridge rail is at the back of the curb.

QUANTIFYING THE NEED FOR PEDESTRIAN FACILITIES

Planning studies should evaluate the need for pedestrian facilities based on the degree to which the following criteria are met.

1. Local Pedestrian Policy
2. Local Government Commitment
3. Continuity and Integration
4. Location
5. Generators
6. Safety
7. Existing or Projected Pedestrian Traffic

REQUIREMENTS FOR DOT FUNDING

REPLACING EXISTING SIDEWALKS

The DOT will pay 100% of the cost to replace an existing sidewalk which is removed to make room for a widening project.

PREVENTING HAZARDS

If there is evidence that a TIP project would create a hazard to existing pedestrian movements, the DOT will take the initiative to not create the hazard. However, if there is not evidence that a TIP project would create a hazard to existing pedestrian movements, the municipality will need to prove there will be pedestrian movements which will be affected within five years by the hazard created by the TIP project.

INCIDENTAL PROJECTS

Due to the technical difficulty of describing justification for pedestrian facilities, the committee chose a cost sharing approach to provide cost containment for the pedestrian facilities. The DOT may share the incremental cost of constructing the pedestrian facilities if the "intent of the criteria" are met. The DOT will pay a matching share of incidental pedestrian facility total construction costs up to a cap of no more than 2% of total project construction cost. The matching share is a sliding scale based on population as follows:

MUNICIPAL POPULATION	PARTICIPATION DOT	LOCAL
> 100,000	50%	50%
50,000 to 100,000	60%	40%
10,000 to 50,000	70%	30%
< 10,000	80%	20%

FUNDING CAPS

Under normal circumstances, the cumulative funding for preventing hazards and providing incidental pedestrian facilities should not exceed 2% of the total project construction cost. A clarification of this was issued on 8-25-94, stating that the 2% funding cap should be computed based on the project construction costs of the portion inside the municipal limits only and not the total construction costs.

INDEPENDENT PROJECTS

The DOT will have a separate category of money for all independent pedestrian facility projects in North Carolina. The independent pedestrian facility funds will be administered similar to the Bicycle Program.

RIGHT-OF-WAY

In general, municipalities are responsible for providing any right-of-way needed to construct pedestrian facilities. However, the 2.4 meter (8 foot) berm the DOT generally provides on urban curb and gutter facilities can accommodate pedestrian facilities.

MAINTENANCE

Local governments will be responsible for maintaining all pedestrian facilities.

PEDESTRIAN POLICY GUIDELINES
4-20-94

INTRODUCTION

These guidelines provide a procedure for implementing the Pedestrian Policy adopted by the Board of Transportation in August 1993. The Pedestrian Policy addresses TIP projects and makes an important distinction between "considering the needs of pedestrians to avoid creating hazards to pedestrian movements" and the concept of "facilitating pedestrian movements for other reasons." Consequently, these guidelines are divided into three main sections:

1) Considering the needs of pedestrians to avoid creating hazards.
2) Quantifying the need for pedestrian facilities.
3) Requirements for DOT funding.

CONSIDERING THE NEEDS OF PEDESTRIANS TO AVOID CREATING HAZARDS

Section "d" of the Pedestrian Policy states: "In the planning, design, and construction of TIP transportation projects, the DOT shall consider the needs of pedestrians and will not create hazards to pedestrian movements." This means that during each phase of a project, a DOT employee should consider how the project will affect pedestrian movements. If the project will create a hazard to pedestrian movement, the DOT should use engineering judgement and find a way to remove the hazard. A hazard in this context is defined as a situation when pedestrian movements are physically blocked in a manner which forces pedestrians to use another mode of transportation, or walk in an automobile traffic lane (parallel with the automobile traffic) to pass a barrier.

This does not mean that the DOT should build pedestrian facilities on all TIP projects. However, it does mean that the DOT should consider how projects will affect pedestrians and how projects can be designed to accommodate vehicular demands without creating barriers to pedestrians. Hazards can be divided into two categories, lateral barriers and perpendicular barriers. Lateral barriers prevent pedestrians from traveling parallel to the roadway. Perpendicular barriers prevent pedestrians from crossing a roadway.

The concept of "not creating a hazard" is intended to allow municipalities to have the flexibility to add pedestrian facilities as part of the project or in the future after the TIP project is complete. Because bridges are so expensive and because they often have useful lives over fifty years, bridges should be

given special consideration when pedestrian travel is anticipated.

BRIDGES

Current standard cross sections generally do not create barriers for pedestrian movements. One exception is on urban bridges where the bridge rail is at the back of the curb. A bridge which has barrier rail or support columns at the back of the curb and gutter is a lateral barrier. On rural bridges, a minimum shoulder may be sufficient to "not create a hazard for pedestrian movements" over or under the bridge.

SHOULDER CROSS SECTIONS

Currently, there is no typical cross section for a rural road with a shoulder, and a pedestrian facility which is outside of the ditch. However, when a rural road with a shoulder section has a pedestrian facility outside of the ditch, the ditch will not be considered a perpendicular barrier. Similarly, as long as there is some space where pedestrians can walk which is not in an automobile travel lane, the ditch will not be considered a lateral barrier either. As amended on 2-15-95, "on shoulder cross-sections, DOT will not permit the construction of separate pedestrian facilities between the road and the ditch."

WIDENING PROJECTS

If a TIP project widens a road from 2 lanes to 5 lanes, the new 5-lane road is not considered a perpendicular barrier. Similarly, as long as there is some space where pedestrians can walk which is not in an automobile travel lane, the new 5-lane road is not considered a lateral barrier either.

RELOCATING PEDESTRIAN MOVEMENTS

This policy is not intended to require a pedestrian bridge or tunnel at interchanges where sidewalks and crosswalks are not practical. In these cases, the DOT may consider relocating the pedestrian movement to avoid creating unsafe situations or making unpractical design modifications. Typically, relocated pedestrian movements should be no more than 800 meters (0.5 miles) away from the original path of the pedestrians. The 800 meter distance is a one way distance, not a round trip distance.

CONSTRUCTION PROCESS

During the construction phase of a project, there may be times when it is not possible to maintain all pedestrian movements through the entire construction process. When necessary, there may be temporary barriers to pedestrian movements in the work zone.

EXAMPLE

For example, the "XYZ" Expressway is a new controlled-access freeway through an established urban area. A major thoroughfare with sidewalks which will have a new interchange with the Expressway, connects a neighborhood on the north side of the Expressway with a hospital on the south side of the Expressway. Because the proposed interchange for the major thoroughfare is a Single-Point-Diamond design with free-flowing ramps in all four quadrants, there is no safe way for a pedestrian to cross the Expressway with out conflicting with free-flowing traffic. Although there is a nearby railroad bridge over the Expressway, pedestrians are prohibited from that bridge because it was not designed to accommodate both trains and pedestrians. Consequently, residents who live in a neighborhood a few blocks from the hospital will now need to drive to the hospital or walk through a free-flowing traffic lane.

Using this example with the new pedestrian policy in effect, the design engineer should make every reasonable effort to design this interchange to accommodate the automobile traffic, and not create a barrier for pedestrian movements. If the interchange design requires free-flow ramps as this Single-Point-Diamond design does, the engineer should determine if it is possible for pedestrians to cross the free-flow traffic lanes. If the peak hour traffic flow has acceptable gaps to allow pedestrians to cross safely, the ramps will not be considered a barrier. However, if traffic volumes or pedestrian volumes are too great, an alternative pedestrian facility should be considered. If accommodating pedestrians at the interchange will compromise safety or good engineering judgement, the engineer should consider if shifting the pedestrian movement away from the interchange is a feasible alternative. Since there is a nearby railroad bridge over the Expressway, maybe the railroad bridge could be designed to handle pedestrian movements too.

QUANTIFYING THE NEED FOR PEDESTRIAN FACILITIES

Section "e" of the Pedestrian Policy states: "The Department recognizes there are certain situations in which pedestrian facilities provide significant benefits in the movement of pedestrian traffic..." If a municipality would like the DOT to consider a project for "significant benefits," the municipality is responsible for collecting any necessary information and submitting a written request prior to the initiation of a planning study. The DOT will review the request and, if necessary, verify the data from the municipality. If pedestrian facilities are not incorporated into a project during the planning phase, and if there are significant factors which change during the time between the project planning study and the project design phase, municipalities may resubmit a request for pedestrian facilities prior to the closure of the comment period for the Design Public Hearing.

Planning studies should evaluate the need for pedestrian facilities based on the degree to which the following seven criteria are met. Municipalities should address each of these criteria when submitting requests for pedestrian facilities. Subsequently, the DOT will make the final determination for pedestrian facility eligibility.

1. **Local Pedestrian Policy.** There is evidence that local policies on urban development are encouraging urban densities and residential developments to occur in a manner to facilitate pedestrian travel by reducing walking distances, and requiring sidewalk construction in development ordinances.
   * Is a pedestrian plan included in the local thoroughfare plan?
   * Do subdivision ordinances require pedestrian facility construction?
   * Do local zoning ordinances facilitate pedestrian travel? (For example, do the zoning ordinances encourage mixed-use developments which are accessible to pedestrians or do the zoning ordinances encourage highway strip development which is not accessible to pedestrians?)

2. **Local Government or Local Sponsor Commitment.** There is a local government/sponsor plan and commitment to provide an integrated system of pedestrian facilities which will connect with pedestrian facilities provided by the project.
   * Does the local Capital Improvement Program include local funds for providing pedestrian facilities which will connect with pedestrian facilities provided by the NC TIP project?
   * How many pedestrian facilities currently connect with the pedestrian facilities provided by the project?
   * How many subdivisions have provided pedestrian facilities which are or will be connected with pedestrian facilities provided by the project?
   * Has a responsible local government agency agreed in writing to maintain the pedestrian facility?

3. **Continuity and Integration.** The project provides a connection to an existing or a proposed pedestrian network and will provide a critical link in the network. * Is the project a critical link in an existing network? (For example, will this
project provide a missing link in an existing network where there are pedestrian facilities extending beyond the length of this project?)

   * Is the project a critical link in a proposed network? (For example, will this project provide any link in a proposed network where there will be pedestrian facilities extending beyond the length of this project?)

4. **Location.** The project is located within a Census defined urban area or growth area where development is anticipated in the immediate future; a majority of the properties within walking

distance of the project are developed, or projected to be developed within 5 years at urban type residential densities.

This five year period will begin at the completion of the appropriate environmental document.

* Is the project located in a Census defined urban area?
* Is the project located in a growth area (Urbanized Area Boundary) where development is anticipated in the immediate future, but is not in a Census defined urban area?
* Are a majority of the properties within walking distance of the project developed, or projected to be developed within 5 years at urban type residential densities (a minimum of 1 dwelling unit per acre)?

5. **Generators.** The project serves as a primary access from one or more of the following to one another:
   - day care, elementary or secondary school
   - college or university
   - community facility (such as library or park)
   - public transportation
   - commercial, office, industry, or business centers - residential areas

   * Will any of these land-uses within two kilometers (1.2 miles) of the project use this project as a primary access?

6. **Safety.** The project provides demonstrable safety benefits for pedestrians.
   * Will the pedestrian facility separate pedestrians from automobile traffic with a posted speed greater than 80 kilometers per hour (50 miles per hour)?
   * Will the pedestrian facility be used by children (0-14), elderly (65+), handicapped, or low-income people?
   * Will the pedestrian facility reduce potential pedestrian-vehicle conflicts?
   * Will the pedestrian facility address the identified safety needs of the area?

7. **Existing or Projected Traffic.** Continued, sustained pedestrian travel can be shown by any of the following:
   - Evidence of existing usage such as well worn paths.
   - Projected usage based on previous experience with similar facilities.
   - Minimum of 150 pedestrians per 24 hour period along a corridor planned for the project.

REPLACING EXISTING SIDEWALKS

Section "b" of the Pedestrian Policy states: "When a highway construction project having to do with the widening of an existing street requires that an existing sidewalk be torn up to make room for the widening, it is the policy of the Department of Transportation to replace the sidewalk." This statement says the DOT will pay 100% of the cost to replace an existing sidewalk which is removed to make room for a widening project. There is no monetary cap for this category of funding pedestrian facilities.

PREVENTING HAZARDS

Section "d" of the Pedestrian Policy states: "In the planning, design, and construction of TIP transportation projects, the DOT shall consider the needs of pedestrians and will not create hazards to pedestrian movements." If there is evidence that a TIP project would create a hazard to existing pedestrian movements, the DOT will take the initiative to not create the hazard. However, if there is not evidence that a TIP project would create a hazard to existing pedestrian movements, the municipality will need to prove there will be pedestrian movements which will be affected within five years by the hazard created by the TIP project. The five year period will begin at the completion of the appropriate environmental document (Categorical Exclusion, Finding of No Significant Impact, or Environmental Impact Statement).

CERTAIN SITUATIONS

Section "e" of the Pedestrian Policy states: "The Department recognizes there are certain situations in which pedestrian facilities provide significant benefits in the movement of pedestrian traffic. The Department of Transportation may participate in the provision of these facilities on a full or shared-cost basis." This statement says the DOT may participate in funding incidental projects, and independent projects as described below.

INCIDENTAL PROJECTS

Incidental pedestrian projects are defined as TIP projects where pedestrian facilities are included as part of the project. The DOT may share the incremental cost of constructing the pedestrian facilities if the "intent of the criteria" are met, and the request for DOT participation is made prior to the closure of the comment period for the Design Public Hearing. The DOT will pay a matching share of incidental pedestrian facility total

construction costs up to a cap of no more than 2% of total project construction cost. This "total project construction cost" does not include the construction cost of any incidental pedestrian facilities. The matching share is a sliding scale based on population as follows:

MUNICIPAL POPULATION	PARTICIPATION DOT	LOCAL
> 100,000	50%	50%
50,000 to 100,000	60%	40%
10,000 to 50,000	70%	30%
< 10,000	80%	20%

The local government share of the pedestrian facility construction funding may not be Federal or State money for the purposes of these guidelines. In addition, the right-of-way municipalities provide for pedestrian projects may not be counted toward the required local contribution.

INDEPENDENT PROJECTS

Independent pedestrian projects are defined as projects where pedestrian facilities are the entire project. The DOT will have a separate category of money for all independent pedestrian facility projects in North Carolina. The independent pedestrian facility funds will be administered similar to Bicycle Program. Municipalities will prioritize their requests under the enhancements section of the local request list, and the DOT will fund as many projects as funding will allow.

GENERAL INFORMATION

The attached flow chart illustrates the decision process for a project engineer. In addition, the funding caps, right-of-way and maintenance requirements described below must also be met.

FUNDING CAPS

Under normal circumstances, the cumulative funding for preventing hazards and providing incidental pedestrian facilities should not exceed 2% of the total project construction cost. This "total project construction cost" does not include the construction cost of any incidental pedestrian facilities. The 2% cap is intended as a guide, not as an absolute cap. Consequently, the appropriate Branch Manager can approve pedestrian funds over the 2% cap.

RIGHT-OF-WAY

In general, municipalities are responsible for providing any right-of-way needed to construct pedestrian facilities. The DOT will allow pedestrian facilities on DOT right-of-way only if the pedestrian facility will not compromise the safety of vehicles or pedestrians. For preventing hazards, the DOT may buy the necessary right-of-way. For incidental and independent projects the DOT shall not pay extra right-of-way cost for pedestrian facilities.

Since the DOT's typical curb and gutter cross-section generally has a 2.4 meter (8 foot) berm, a 1.5 meter (5 foot) pedestrian facility may fit within this standard right-of-way. However, on curb and gutter sections, most municipalities want a 3 meter (10 foot) berm to put a 1.5 meter (5 foot) grassy strip and a 1.5 meter (5 foot) pedestrian facility. In this situation, the municipalities will need to provide the additional 0.6 meters (2 feet) of right-of-way.

On shoulder cross sections, the DOT typically does not have additional right-of-way behind the ditch. In addition, the DOT does not put paved pedestrian facilities between the road and the ditch. Since the DOT would not typically have the right-of-way needed for a pedestrian facility, the municipality must provide all of the additional right-of-way.

Applicable AASHTO standards for right-of-way and design must be met. The DOT will not narrow automobile travel lanes to accommodate incidental pedestrian facilities. For example, if a project specifies five 3.6 meter (12 foot) lanes on a section of road, the DOT will not reduce the width of the travel lanes to 3.0 meters (10 feet) to create room for pedestrian facilities. In addition, if right-of-way is restricted, and there is insufficient room for pedestrian facilities and a utility strip, the utility strip will take precedence.

Applicable Federal and State regulations must also be met. For example, if right-of-way for a particular project is restricted by historic property, federal regulations on historic preservation may prohibit the DOT from using additional right-of-way for pedestrian facilities.

MAINTENANCE

Local governments are responsible for maintaining all pedestrian facilities. The Municipal Agreement will formally specify that the DOT is not responsible for maintaining pedestrian facilities.

APPENDIX

POLICY ADOPTED BY THE NC BOARD OF TRANSPORTATION

.0406 CONSTRUCTION AND MAINTENANCE OF SIDEWALKS AND OTHER PEDESTRIAN FACILITIES

(a) It is the policy of the Board of Transportation that highway funds are for the purpose of constructing and improving streets and highways for the movement of people and goods. Generally, within municipalities, the construction of a sidewalk on a state highway system street is considered a municipal responsibility.

(b) When a highway construction project having to do with the widening of an existing street requires that an existing sidewalk be torn up to make room for the widening, it is the policy of the Department of Transportation to replace the sidewalk.

(c) For construction and widening projects where sidewalks do not already exist, it is the policy of the Department of Transportation that it will not participate in the construction of sidewalks except as in subsections (d) and (e). If adequate right of way is available, the Department of Transportation will grade out a level walking area back of the curb in the utility strip. The municipality may, at its own discretion, construct sidewalks. If the municipality desires sidewalks as a part of the construction project, they will be constructed and the city will reimburse the Department of Transportation for the cost of the sidewalks by appropriate municipal agreement.

(d) In the planning, design, and construction of TIP transportation projects, the Department of Transportation shall consider the needs of pedestrians and will not create hazards to pedestrian movements.

(e) The Department recognizes there are certain situations in which pedestrian facilities provide significant benefits in the movement of pedestrian traffic. The Department of Transportation may participate in the provision of these facilities on a full or share cost basis.

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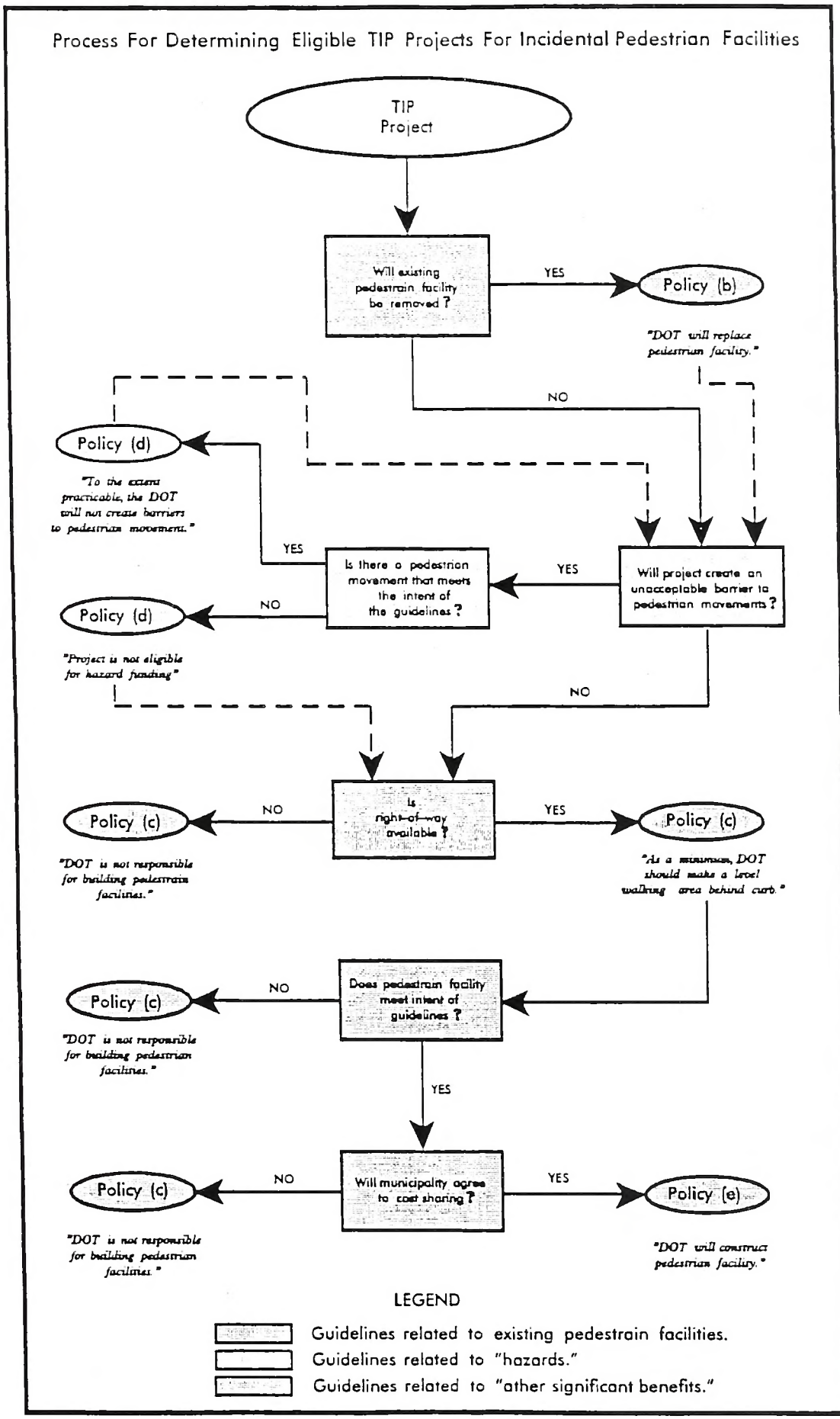
Process For Determining Eligible TIP Projects For Incidental Pedestrian Facilities
TIP Project
Will existing pedestrain facility be removed ?
YES
Policy (b)
"DOT will replace pedestrian facility."
NO
Policy (d)
"To the extent practicable, the DOT will not create barriers to pedestrian movement."
YES
Is there a pedestrian movement that meets the intent of the guidelines ?
YES
Will project create an unacceptable barrier to pedestrian movements ?
NO
Policy (d)
"Project is not eligible for hazard funding"
NO
Is right-of-way available ?
NO
Policy (c)
"DOT is not responsible for building pedestrain facilities."
YES
Policy (c)
"As a minimum, DOT should make a level walking area behind curb."
Does pedestrain facility meet intent of guidelines ?
NO
Policy (c)
"DOT is not responsible for building pedestrian facilities."
YES
Will municipality agree to cost sharing ?
NO
Policy (c)
"DOT is not responsible for building pedestrian facilities."
YES
Policy (e)
"DOT will construct pedestrian facility."
LEGEND
Guidelines related to existing pedestrain facilities.
Guidelines related to "hazards."
Guidelines related to "other significant benefits."

FIGURE 22

APPENDIX B

RECOMMENDED SUBDIVISION ORDINANCES

DEFINITIONS

I. Streets And Roads

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily

to provide direct access to abutting land.

C. Specific Type Rural Or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major intersections. A parkway is for non-commercial traffic, with full or partial control of access.

2. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 760 meters (2500 ft) in length, or streets less than 1.6 kilometers (1.0 miles) in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than 4 hectares (10 acres) where no street right-of-way dedication is involved, (3) the public acquisition, by purchase, of strips of land for the widening or the opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than 0.8 hectares (2 acres) into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets And Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if

possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

		Minimum ROW	
1.	Rural		
	a. Principle Arterial		
	Freeways	105 m	(350 ft)
	Other	60 m	(200 ft)
	b. Minor Arterial	30 m	(100 ft)
	c. Major Collector	30 m	(100 ft)
	d. Minor Collector	24 m	(80 ft)
	e. Local Road	18 m[1]	(60 ft)
2.	Urban		
	a. Major Thoroughfare other than Freeway and Expressway	27 m	(90 ft)
	b. Minor Thoroughfare	21 m	(70 ft)
	c. Local Street	18 m[1]	(60 ft)
	d. Cul-de-sac	Variable[2]	

The subdivider will only be required to dedicate a maximum of 30 meters (100 ft) of right-of-way. In cases where over 30 meters (100 ft) of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 30 meters (100 ft). On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 18 meters (60 ft) in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

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1. The desirable minimum right-of-way (ROW) is 18 meters (60 ft). If curb and gutter is provided, 15 meters (50 ft) of ROW is adequate on local residential streets.
2. The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   a. Curb and Gutter section: 7.8 meters (26 ft), face to face of curb
   b. Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.2 meters (4 ft) for shoulders

2. Residential Collector
   a. Curb and Gutter section: 10.2 meters (34 ft), face to face of curb
   b. Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.8 meters (6 ft) for shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 10 km/h (5 mph) greater than the posted speed limit. The design speeds for subdivision type streets shall be:

DESIGN SPEEDS (METRIC)

Facility Type	Design Speed (km/h) Desirable	Minimum Level	Minimum Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	100	80	60
Local roads including Residential Collectors and Local Residential (ADT Over 400)	80	80	60
URBAN			
Major Thoroughfares other than Freeway or Expressway	100	60	60
Minor Thoroughfares	100	50	50
Local Streets	50	50	30

DESIGN SPEEDS (ENGLISH)

Facility Type	Design Speed (mph) Desirable	Minimum Level	Minimum Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local roads including Residential Collectors and Local Residential (ADT Over 400)	50	* 50	* 40
URBAN			
Major Thoroughfares other than Freeway or Expressway	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

* Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce min. design speed.
**Based on projected ADT of 50-250. (Reference: NCDOT, Roadway Design Manual, page 1-1B)

2. Maximum And Minimum Grades

a. The maximum grades in percent shall be as shown below on the next two tables.

b. Minimum grade should not be less than 0.5%.

c. Grades for 30 meters (100 ft) each way from intersections (measured from edge of pavement) should not exceed 5%.

MAXIMUM VERTICAL GRADE (METRIC)

Facility Type	Design Speed (km/h)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads *	30	7	10	12
	50	7	9	10
	65	7	8	10
	80	6	7	9
	100	5	6	8
	110	4	5	6
Local roads including Residential Collectors and Local Residential Streets *	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	50	8	9	11
	65	7	8	10
	80	6	7	9
	100	5	6	8
Minor Thoroughfares *	30	9	12	14
	50	9	11	12
	65	9	10	12
	80	7	8	10
	100	6	7	9
	110	5	6	7
Local Streets *	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-

For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference: NCDOT, Metric Design Manual, page 1-12, T-3)

MAXIMUM VERTICAL GRADES (ENGLISH)

Facility Type	Design Speed (mph)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads *	20	7	10	12
	30	7	9	10
	40	7	8	10
	50	6	7	9
	60	5	6	8
	70	4	5	6
Local roads including Residential Collectors and Local Residential Streets *	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	30	8	9	11
	40	7	8	10
	50	6	7	9
	60	5	6	8
Minor Thoroughfares *	20	9	12	14
	30	9	11	12
	40	9	10	12
	50	7	8	10
	60	6	7	9
	70	5	6	7
Local Streets *	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-

* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference: NCDOT, Roadway Design Manual, page 1-12, T-3)

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

SIGHT DISTANCE (METRIC)

Design Speed (km/h)	30	50	60	90	100
Stopping Sight Distance					
Minimum (meters)	29.6	57.4	74.3	131.2	157.0
Desirable (meters)	30	70	90	170	210
Minimum K* Value for:					
Crest curve	3	9	14	43	62
Sag curve	4	11	15	30	37
Passing Sight Distance:					
Minimum Passing Distance for two lanes, in m	*	*	*	*	*

(General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case.)
* Currently under revision.
(Reference: NCDOT, Metric Design Manual, page 1-12, T-1)

SIGHT DISTANCE (ENGLISH)

Design Speed (mph)	30	40	50	60
Stopping Sight Distance:				
Minimum (ft.)	200	275	400	525
Desirable (ft.)	200	325	475	650
Minimum K* Value for:				
Crest Curve	30	60	110	190
Sag Curve	40	60	90	120
Passing Sight Distance:				
Minimum Passing Distance for 2 lanes, in feet	1,100	1,500	1,800	2,100

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)
(Reference: NCDOT, Roadway Design Manual, page 1-12, T-1)

* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with A Policy on Geometric Design of Highways and Streets (1990).

4. The "Superelevation Table" shown below shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

SUPERELEVATION TABLE (METRIC)

Design Speed	Maximum e*	Minimum Radius m
50 km/h	0.04	100
65	0.04	175
80	0.04	280
100	0.04	490
50	0.06	90
65	0.06	160
80	0.06	250
100	0.06	435
50	0.08	80
65	0.08	145
80	0.08	230
100	0.08	395

* e = rate of roadway superelevation, meter per meter

SUPERELEVATION TABLE (ENGLISH)

Design Speed	Maximum e*	Minimum Radius ft.	Max. Deg. of Curve
30 mph	0.04	302	19 00'
40	0.04	573	10 00'
50	0.04	955	6 00'
60	0.04	1,637	3 45'
30	0.06	273	21 00'
40	0.06	521	11 15'
50	0.06	955	6 45
60	0.06	1,432	4 15'
30	0.08	260	22 45'
40	0.08	477	12 15'
50	0.08	819	7 30'
60	0.08	1,146	4 45'

* e = rate of roadway superelevation, foot per foot
(Reference: NCDOT, Roadway Design Manual, page 1-12, T-6 thru T-8)

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect

any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters (200 ft) between survey center lines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than 150 meters (500 ft) in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 6.0 meters (20 ft).

3. Dead end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead end as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9.0 meters (30 ft) from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters (6 ft) from the face of curb.

I. Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width On Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder Section Approach

i. Under 800 ADT design year - Minimum 8.4 meters (28 ft) width face to face of parapets, rails, or pavement width plus 3.0 meters (10 ft), whichever is greater.

ii. 800 to 2000 ADT design year - Minimum 10.2 meters (34 ft) width face to face of parapets, rails, or pavement width plus 3.6 meters (12 ft), whichever is greater.

iii. Over 2000 ADT design year - Minimum width of 12 meters (40 ft), desirable width of 13.2 meters (44 ft) width face to face of parapets or rails.

b. Curb And Gutter Approach

i. Under 800 ADT design year - Minimum 7.2 meters (24 ft) face to face of curbs.

ii. Over 800 ADT design year - Width of approach pavement measured face to face of curbs. Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters (1' 6"), or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

   a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 2.4 m (8 ft) minimum, 3.0 m (10 ft) desirable.)

   b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.

Note: English equivalents are printed in this report merely as a guide. The English measurements were not meant to represent exact conversions, and should not be used for standards, regulations, or construction. The tables in this section were taken from the Roadway Design Unit manuals. In the event of conflicting information, the Standard Specifications for Roads and Structures and the Metric Design Manual should serve as the standard.

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APPENDIX C

TABLE 10

SILER CITY 1993 BASE YEAR DWELLING UNIT SUMMARY -

ZONE	EXCELLENT	ABOVE	AVERAGE	BELOW	POOR	TOTAL
1	0	0	31	45	6	82
2	0	1	20	33	0	54
3	4	27	50	22	3	106
4	0	0	63	77	23	163
5	0	5	150	41	0	196
6	0	0	9	23	70	102
7	1	3	71	138	112	325
8	0	0	0	111	16	127
9	0	0	25	105	0	130
10	8	57	11	9	5	90
11	0	0	13	51	36	100
12	0	11	61	33	18	123
13	0	0	1	38	40	79
14	0	0	15	18	5	38
15	0	0	12	92	28	132
16	0	0	39	47	135	221
17	0	0	3	8	96	107
18	0	0	2	141	8	151
19	0	0	2	17	34	53
20	0	0	3	10	11	24
21	4	19	10	17	12	62
22	0	0	6	19	17	42
23	0	0	2	44	8	54
24	0	0	6	42	23	71
25	0	0	6	26	19	51
26	0	0	22	39	3	64
27	0	0	19	31	6	56
28	0	0	8	11	7	26
29	0	1	23	18	48	90
30	0	0	6	33	1	40
31	0	0	3	15	3	21
32	0	0	1	3	10	14
33	0	0	1	4	3	8
34	0	0	4	11	9	24
35	0	0	2	22	20	44
36	0	0	12	22	5	39
37	0	1	1	8	9	19
38	0	0	3	8	25	36
39	0	0	5	19	23	47
TOTAL	17	125	721	1451	897	3211
(%)	0.5	3.9	22.5	45.2	27.9	100.0

TABLE 11
SILER CITY 1993 BASE YEAR EMPLOYMENT SUMMARY

ZONE	INDUSTRY	SALES	SPECIAL	SERVICE	OFFICE	TOTAL
1	7	82	1	56	86	232
2	30	37	15	63	36	181
3	29	3	6	4	0	42
4	2	60	7	36	0	105
5	112	52	3	17	0	184
6	251	6	105	33	18	413
7	1361	61	0	102	6	1530
8	245	0	0	66	39	350
9	741	73	10	2	0	826
10	0	0	0	2	0	2
11	0	24	0	0	0	24
12	0	0	0	41	0	41
13	34	22	0	22	0	78
14	91	160	10	108	12	381
15	31	10	5	7	0	53
16	850	200	128	19	4	1201
17	64	3	112	13	0	192
18	177	0	0	3	2	182
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	3	0	0	0	3
22	0	0	0	0	0	0
23	0	1	0	1	0	2
24	0	0	0	0	0	0
25	0	8	0	0	0	8
26	144	1	0	2	0	147
27	0	0	4	8	0	12
28	46	0	0	0	0	46
29	18	0	0	3	0	21
30	0	0	0	0	0	0
31	0	0	0	4	0	4
32	17	0	0	0	0	17
33	0	0	0	0	0	0
34	0	0	0	0	0	0
35	0	0	0	0	0	0
36	27	0	0	0	0	27
37	0	0	0	0	0	0
38	2	0	0	0	0	2
39	0	0	0	0	0	0
TOTAL	4279	806	406	612	203	6306
(%)	67.9	12.8	6.4	9.7	3.2	100.0

TABLE 12
SILER CITY 1993 BASE YEAR COMMERCIAL VEHICLE SUMMARY

ZONE	CARS	TRUCKS	TOTAL
1	21	26	47
2	1	16	17
3	0	2	2
4	0	8	8
5	1	6	7
6	1	9	10
7	2	82	84
8	5	12	17
9	1	32	33
10	0	0	0
11	0	1	1
12	0	3	3
13	2	15	17
14	34	34	68
15	5	25	30
16	7	14	21
17	2	48	50
18	0	16	16
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	2	2
26	0	6	6
27	0	0	0
28	1	25	26
29	0	14	14
30	0	0	0
31	3	1	4
32	0	0	0
33	0	0	0
34	0	0	0
35	0	0	0
36	0	1	1
37	0	0	0
38	0	1	1
39	0	0	0
TOTAL	86	399	485
(%)	17.7	82.3	100.0

TABLE 13
SILER CITY 2020 DESIGN YEAR DWELLING UNIT SUMMARY

ZONE	EXCELLENT	ABOVE	AVERAGE	BELOW	POOR	TOTAL
1	0	6	41	33	0	80
2	0	1	30	30	0	61
3	14	52	75	42	0	183
4	0	50	113	77	13	253
5	0	5	150	41	0	196
6	0	0	9	33	50	92
7	6	13	81	138	82	320
8	0	5	10	121	11	147
9	0	40	65	105	0	210
10	58	82	21	9	2	172
11	0	0	63	51	30	144
12	0	51	134	33	13	231
13	0	25	101	58	35	219
14	0	0	15	18	0	33
15	0	0	42	92	23	157
16	0	0	49	52	105	206
17	0	0	13	8	86	107
18	0	60	302	141	8	511
19	0	0	12	27	29	68
20	0	0	6	10	10	26
21	4	69	35	17	12	137
22	0	0	6	19	7	32
23	0	0	42	59	4	105
24	0	0	36	72	13	121
25	0	0	26	26	9	61
26	0	20	32	39	0	91
27	0	10	44	41	3	98
28	0	0	8	11	4	23
29	0	6	43	38	38	125
30	0	20	26	33	0	79
31	0	10	18	25	0	53
32	0	0	2	3	10	15
33	0	0	1	4	3	8
34	0	0	14	21	0	35
35	0	0	2	22	20	44
36	0	0	12	22	5	39
37	0	1	1	8	9	19
38	0	0	3	8	25	36
39	0	0	5	19	23	47
TOTAL	82	526	1688	1606	682	4584
(%)	1.8	11.5	36.8	35.0	14.9	100.0

TABLE 14
SILER CITY 2020 DESIGN YEAR EMPLOYMENT SUMMARY

ZONE	INDUSTRY	SALES	SPECIAL	SERVICE	OFFICE	TOTAL
1	107	182	31	86	186	592
2	30	42	25	73	36	206
3	29	18	6	14	0	67
4	12	100	17	46	0	175
5	112	52	13	17	0	194
6	251	41	125	33	58	508
7	1421	91	0	122	46	1680
8	285	0	0	66	39	390
9	791	93	60	12	0	956
10	0	5	0	7	0	12
11	0	24	0	0	0	24
12	0	0	0	51	0	51
13	34	22	0	22	0	78
14	191	160	20	108	52	531
15	31	20	10	12	0	73
16	900	200	128	39	44	1311
17	64	0	112	13	0	189
18	177	0	0	0	0	177
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	6	0	0	0	6
22	0	0	0	0	0	0
23	0	11	0	11	0	22
24	0	40	10	15	0	65
25	0	48	0	0	0	48
26	214	11	0	12	0	237
27	0	5	4	8	0	17
28	46	0	0	0	0	46
29	28	0	0	3	0	31
30	0	0	0	0	0	0
31	0	10	0	14	0	24
32	17	0	0	0	0	17
33	150	10	0	0	0	160
34	0	0	0	0	0	0
35	0	0	0	0	0	0
36	27	0	0	0	0	27
37	0	0	0	0	0	0
38	147	0	0	0	10	157
39	0	0	0	0	0	0
TOTAL	5064	1191	561	784	471	8071
(%)	62.7	14.8	7.0	9.7	5.8	100.0

TABLE 15
SILER CITY 2020 DESIGN YEAR COMMERCIAL VEHICLE SUMMARY

ZONE	CARS	TRUCKS	TOTAL
1	63	77	140
2	4	22	26
3	1	4	5
4	2	14	16
5	1	6	7
6	3	14	17
7	7	97	104
8	5	12	17
9	3	42	45
10	0	0	0
11	0	1	1
12	0	4	4
13	2	15	17
14	54	54	108
15	7	30	37
16	10	19	29
17	2	48	50
18	0	16	16
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	2	2
25	0	5	5
26	2	10	12
27	0	0	0
28	1	25	26
29	0	14	14
30	0	0	0
31	4	1	5
32	0	0	0
33	2	7	9
34	0	0	0
35	0	0	0
36	0	2	2
37	0	0	0
38	3	7	10
39	0	0	0
TOTAL	176	548	724
(%)	24.3	75.7	100.0

APPENDIX D

TABLE 16
SILER CITY 1993 BASE YEAR INTERNAL DATA SUMMATION

IDS CALCULATIONS

SILER CITY THOROUGHFARE PLAN
1993 BASE YEAR SOCIOECONOMIC DATA

TRIP STATISTICS

TRIPS PRODUCED BY THE HOUSING UNITS = 29024
INTERNAL OF TOTAL = 90.0% INTERNAL TRIPS = 26122
HBW OF INTERNAL = 30.0% HBW TRIPS = 7837
HBO OF INTERNAL = 45.0% HBO TRIPS = 11755
NHB OF INTERNAL = 25.0% NHB TRIPS = 6531

COMM VEH TRIPS TOTAL = 3247 INTERNAL = 2922
TRIPS PRODUCED BY EXTERNAL STATIONS = 28084
NHB SECONDARY TRIPS = 10000

OTHER RESULTS

AVERAGE DU GENERATION RATE = 9.04 Trips/DU
(Only includes 5 standard housing class)

EMPLOYEE/POPULATION RATIO = .78 EMP/PER
(Total Employees in X1 - X8.)

REGRESSION COEFFICIENTS

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	DU S	CONST
HBW	1.00	1.00	1.00	1.00	1.00	.00	.00	.00	.00	.00	.00	.00	.00
HBO	1.00	1.80	8.40	2.60	2.50	.00	.00	.00	.00	.00	.00	.50	.00
NHB	1.00	1.80	8.40	2.60	2.50	.00	.00	.00	.00	.00	.00	.50	.00
EXT-INT	1.00	1.80	8.40	2.60	2.50	.00	.00	.00	.00	.00	.00	.50	.00

ATTRACTION FACTORS

ZN	HBW	HBO	NHB	EX-IN
1	232	565	565	565
2	181	504	504	504
3	42	147	147	147
4	105	345	345	345
5	184	373	373	373
6	413	1326	1326	1326
7	1530	1914	1914	1914

TABLE 16
SILER CITY 1993 BASE YEAR INTERNAL DATA SUMMATION

° 8	350	579	579	579
° 9	826	1026	1026	1026
° 10	2	50	50	50
° 11	24	93	93	93
° 12	41	169	169	169
° 13	78	171	171	171
° 14	381	793	793	793
° 15	53	175	175	175
° 16	1201	2455	2455	2455
° 17	192	1098	1098	1098
° 18	182	266	266	266
° 19	0	27	27	27
° 20	0	12	12	12
° 21	3	36	36	36
° 22	0	21	21	21
° 23	2	32	32	32
° 24	0	36	36	36
° 25	8	40	40	40
° 26	147	183	183	183
° 27	12	83	83	83
° 28	46	59	59	59
° 29	21	71	71	71
° 30	0	20	20	20
° 31	4	21	21	21
° 32	17	24	24	24
° 33	0	4	4	4
° 34	0	12	12	12
° 35	0	22	22	22
° 36	27	47	47	47
° 37	0	10	10	10
° 38	2	20	20	20
° 39	0	24	24	24
° 40	0	0	0	0
° 41	0	0	0	0
° 42	0	0	0	0
° 43	0	0	0	0
° 44	0	0	0	0
° 45	0	0	0	0
° 46	0	0	0	0
° 47	0	0	0	0
° 48	0	0	0	0
° 49	0	0	0	0
° 50	0	0	0	0
° 51	0	0	0	0
° 52	0	0	0	0
° 53	0	0	0	0
° 54	0	0	0	0
° 55	0	0	0	0
° 56	0	0	0	0
° 57	0	0	0	0

TABLE 16
SILER CITY 1993 BASE YEAR INTERNAL DATA SUMMATION

58	0	0	0	0
59	0	0	0	0
60	0	0	0	0
61	0	0	0	0
62	0	0	0	0
63	0	0	0	0
64	0	0	0	0
65	0	0	0	0
66	0	0	0	0
	6306	12853	12853	12853

Calculation of Productions and Attractions

ZN	TOTAL TRIPS	INTERL TRIPS	HBW PROD	HBO PROD	NHB PROD	NHBSEC PROD	CV PROD	INT CV PROD	TOTNHB PROD	EX-INT PROD	HBW ATTR	HBO ATTR	NHB ATTR	EX-INT ATTR
1	763	687	206	309	287	440	315	283	1010	0	288	517	855	1223
2	508	457	137	206	256	392	114	103	751	0	225	461	763	1091
3	1067	960	288	432	75	114	13	12	201	0	52	134	222	318
4	1507	1356	407	610	175	268	54	49	492	0	130	316	522	747
5	1924	1732	520	779	190	290	47	42	522	0	229	341	565	808
6	857	771	231	347	674	1032	67	60	1766	0	513	1213	2007	2871
7	2893	2604	781	1172	973	1489	562	506	2968	0	1901	1750	2897	4144
8	1127	1014	304	456	294	450	113	102	846	0	435	530	876	1254
9	1195	1075	323	484	521	798	221	199	1518	0	1027	938	1553	2221
10	954	859	258	387	25	39	0	0	64	0	2	46	76	108
11	877	789	237	355	47	72	7	6	125	0	30	85	141	201
12	1172	1055	317	475	86	131	20	18	235	0	51	155	256	366
13	672	605	182	272	87	133	113	102	322	0	97	156	259	370
14	352	317	95	143	403	617	456	410	1430	0	474	725	1200	1717
15	1172	1055	317	475	89	136	200	180	405	0	66	160	265	379
16	1893	1704	511	767	1247	1910	141	127	3284	0	1493	2245	3716	5315
17	870	783	235	352	558	854	335	301	1713	0	239	1004	1662	2377
18	1353	1218	365	548	135	207	107	96	438	0	226	243	403	576
19	445	400	120	180	14	21	0	0	35	0	0	25	41	58
20	208	187	56	84	6	9	0	0	15	0	0	11	18	26
21	606	545	164	245	18	28	0	0	46	0	4	33	54	78
22	367	330	99	148	11	16	0	0	27	0	0	19	32	45
23	480	432	130	194	16	25	0	0	41	0	2	29	48	69
24	622	560	168	252	18	28	0	0	46	0	0	33	54	78
25	446	401	120	180	20	31	13	12	63	0	10	37	61	87
26	595	535	161	241	93	142	40	36	271	0	183	167	277	396
27	517	465	140	209	42	65	0	0	107	0	15	76	126	180
28	235	211	63	95	30	46	174	157	233	0	57	54	89	128
29	787	708	212	319	36	55	94	85	176	0	26	65	107	154
30	365	328	98	148	10	16	0	0	26	0	0	18	30	43
31	189	170	51	76	11	16	27	24	51	0	5	19	32	45
32	117	105	32	47	12	19	0	0	31	0	21	22	36	52
33	70	63	19	28	2	3	0	0	5	0	0	4	6	9

TABLE 16
SILER CITY 1993 BASE YEAR INTERNAL DATA SUMMATION

° 34	211	190	57	85	6	9	0	0	15	0	0	11	18	26
° 35	378	340	102	153	11	17	0	0	28	0	0	20	33	48
° 36	358	322	97	145	24	37	7	6	67	0	34	43	71	102
° 37	165	148	44	67	5	8	0	0	13	0	0	9	15	22
° 38	302	272	82	122	10	16	7	6	32	0	2	18	30	43
° 39	405	364	109	164	12	19	0	0	31	0	0	22	36	52
° 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 51	0	0	0	0	0	0	0	0	0	1803	0	0	0	0
° 52	0	0	0	0	0	0	0	0	0	3281	0	0	0	0
° 53	0	0	0	0	0	0	0	0	0	753	0	0	0	0
° 54	0	0	0	0	0	0	0	0	0	2094	0	0	0	0
° 55	0	0	0	0	0	0	0	0	0	1874	0	0	0	0
° 56	0	0	0	0	0	0	0	0	0	4227	0	0	0	0
° 57	0	0	0	0	0	0	0	0	0	420	0	0	0	0
° 58	0	0	0	0	0	0	0	0	0	265	0	0	0	0
° 59	0	0	0	0	0	0	0	0	0	164	0	0	0	0
° 60	0	0	0	0	0	0	0	0	0	4253	0	0	0	0
° 61	0	0	0	0	0	0	0	0	0	1563	0	0	0	0
° 62	0	0	0	0	0	0	0	0	0	2348	0	0	0	0
° 63	0	0	0	0	0	0	0	0	0	318	0	0	0	0
° 64	0	0	0	0	0	0	0	0	0	633	0	0	0	0
° 65	0	0	0	0	0	0	0	0	0	585	0	0	0	0
° 66	0	0	0	0	0	0	0	0	0	3503	0	0	0	0
°														
°	29024	26122	7837	11755	6531	10000	3247	2922	19449	28084	7837	11754	19452	27827

IDS 2.01 30JUN92 >> CALC-93.SIL 05DEC95

TABLE 17
SILER CITY 2020 DESIGN YEAR INTERNAL DATA SUMMATION

IDS CALCULATIONS

SILER CITY THOROUGHFARE PLAN
2020 DESIGN YEAR SOCIOECONOMIC DATA

TRIP STATISTICS

TRIPS PRODUCED BY THE HOUSING UNITS = 43560
INTERNAL OF TOTAL = 90.0% INTERNAL TRIPS = 39204
HBW OF INTERNAL = 30.0% HBW TRIPS = 11761
HBO OF INTERNAL = 45.0% HBO TRIPS = 17642
NHB OF INTERNAL = 25.0% NHB TRIPS = 9801

COMM VEH TRIPS TOTAL = 4848 INTERNAL = 4363
TRIPS PRODUCED BY EXTERNAL STATIONS = 45721
NHB SECONDARY TRIPS = 20000

OTHER RESULTS

AVERAGE DU GENERATION RATE = 9.50 Trips/DU
(Only includes 5 standard housing class)

EMPLOYEE/POPULATION RATIO = .76 EMP/PER
(Total Employees in X1 - X8.)

REGRESSION COEFFICIENTS

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	DU S	CONST
HBW	1.00	1.00	1.00	1.00	1.00	.00	.00	.00	.00	.00	.00	.00	.00
HBO	1.00	1.80	8.40	2.60	2.50	.00	.00	.00	.00	.00	.00	.50	.00
NHB	1.00	1.80	8.40	2.60	2.50	.00	.00	.00	.00	.00	.00	.50	.00
EXT-INT	1.00	1.80	8.40	2.60	2.50	.00	.00	.00	.00	.00	.00	.50	.00

ATTRACTION FACTORS

ZN	HBW	HBO	NHB	EX-IN
1	592	1424	1424	1424
2	206	627	627	627
3	67	239	239	239
4	175	582	582	582
5	194	457	457	457
6	508	1652	1652	1652
7	1680	2177	2177	2177
8	390	629	629	629
9	956	1598	1598	1598

TABLE 17
SILER CITY 2020 DESIGN YEAR INTERNAL DATA SUMMATION

° 10	12	113	113	113
° 11	24	115	115	115
° 12	51	249	249	249
° 13	78	241	241	241
° 14	531	1075	1075	1075
° 15	73	261	261	261
° 16	1311	2649	2649	2649
° 17	189	1093	1093	1093
° 18	177	433	433	433
° 19	0	34	34	34
° 20	0	13	13	13
° 21	6	80	80	80
° 22	0	16	16	16
° 23	22	102	102	102
° 24	65	256	256	256
° 25	48	117	117	117
° 26	237	311	311	311
° 27	17	113	113	113
° 28	46	58	58	58
° 29	31	99	99	99
° 30	0	40	40	40
° 31	24	81	81	81
° 32	17	25	25	25
° 33	160	172	172	172
° 34	0	18	18	18
° 35	0	22	22	22
° 36	27	47	47	47
° 37	0	10	10	10
° 38	157	190	190	190
° 39	0	24	24	24
° 40	0	0	0	0
° 41	0	0	0	0
° 42	0	0	0	0
° 43	0	0	0	0
° 44	0	0	0	0
° 45	0	0	0	0
° 46	0	0	0	0
° 47	0	0	0	0
° 48	0	0	0	0
° 49	0	0	0	0
° 50	0	0	0	0
° 51	0	0	0	0
° 52	0	0	0	0
° 53	0	0	0	0
° 54	0	0	0	0
° 55	0	0	0	0
° 56	0	0	0	0
° 57	0	0	0	0
° 58	0	0	0	0
° 59	0	0	0	0

TABLE 17
SILER CITY 2020 DESIGN YEAR INTERNAL DATA SUMMATION

60	0	0	0	0
61	0	0	0	0
62	0	0	0	0
63	0	0	0	0
64	0	0	0	0
65	0	0	0	0
66	0	0	0	0
	8071	17442	17442	17442

Calculation of Productions and Attractions

ZN	TOTAL TRIPS	INTERL TRIPS	HBW PROD	HBO PROD	NHB PROD	NHBSEC PROD	CV PROD	INT CV PROD	TOTNHB PROD	EX-INT PROD	HBW ATTR	HBO ATTR	NHB ATTR	EX-INT ATTR
1	773	696	209	313	800	1633	938	844	3277	0	863	1440	2789	3733
2	581	523	157	235	352	719	174	157	1228	0	300	634	1228	1644
3	1868	1681	504	756	134	274	34	31	439	0	98	242	468	626
4	2477	2229	669	1003	327	667	107	96	1090	0	255	589	1140	1526
5	1924	1732	520	779	257	524	47	42	823	0	283	462	895	1198
6	787	708	212	319	928	1894	114	103	2925	0	740	1671	3236	4330
7	2923	2631	789	1184	1223	2496	697	627	4346	0	2448	2202	4264	5706
8	1332	1199	360	540	353	721	113	102	1176	0	568	636	1232	1649
9	2035	1831	549	824	898	1832	301	271	3001	0	1393	1616	3130	4189
10	1905	1714	514	771	63	130	0	0	193	0	17	114	221	296
11	1329	1196	359	538	65	132	7	6	203	0	35	116	225	301
12	2302	2072	622	932	140	286	27	24	450	0	74	252	488	653
13	2087	1878	563	845	135	276	113	102	513	0	114	244	472	632
14	312	281	84	126	604	1233	724	652	2489	0	774	1087	2106	2818
15	1432	1289	387	580	147	299	248	223	669	0	106	264	511	684
16	1798	1618	485	728	1489	3037	194	175	4701	0	1910	2679	5189	6944
17	890	801	240	360	614	1253	335	301	2168	0	275	1106	2141	2865
18	5013	4512	1354	2030	243	497	107	96	836	0	258	438	848	1135
19	595	535	161	241	19	39	0	0	58	0	0	34	67	89
20	230	207	62	93	7	15	0	0	22	0	0	13	25	34
21	1406	1265	380	569	45	92	0	0	137	0	9	81	157	210
22	287	258	77	116	9	18	0	0	27	0	0	16	31	42
23	983	885	266	398	57	117	0	0	174	0	32	103	200	267
24	1112	1001	300	450	144	294	13	12	450	0	95	259	501	671
25	566	509	153	229	66	134	33	30	230	0	70	118	229	307
26	891	802	241	361	175	357	80	72	604	0	345	315	609	815
27	943	849	255	382	63	130	0	0	193	0	25	114	221	296
28	211	190	57	85	33	67	174	157	257	0	67	59	114	152
29	1142	1028	308	463	56	114	94	85	255	0	45	100	194	260
30	777	699	210	315	22	46	0	0	68	0	0	40	78	105
31	515	463	139	208	46	93	34	31	170	0	35	82	159	212
32	127	114	34	51	14	29	0	0	43	0	25	25	49	66
33	70	63	19	28	97	197	60	54	348	0	233	174	337	451
34	329	296	89	133	10	21	0	0	31	0	0	18	35	47
35	378	340	102	153	12	25	0	0	37	0	0	22	43	58

TABLE 17
SILER CITY 2020 DESIGN YEAR INTERNAL DATA SUMMATION

° 36	358	322	97	145	26	54	13	12	92	0	39	48	92	123
° 37	165	148	44	67	6	11	0	0	17	0	0	10	20	26
° 38	302	272	82	122	107	218	67	60	385	0	229	192	372	498
° 39	405	364	109	164	13	28	0	0	41	0	0	24	47	63
° 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
° 51	0	0	0	0	0	0	0	0	0	3994	0	0	0	0
° 52	0	0	0	0	0	0	0	0	0	5079	0	0	0	0
° 53	0	0	0	0	0	0	0	0	0	1747	0	0	0	0
° 54	0	0	0	0	0	0	0	0	0	3903	0	0	0	0
° 55	0	0	0	0	0	0	0	0	0	3226	0	0	0	0
° 56	0	0	0	0	0	0	0	0	0	5939	0	0	0	0
° 57	0	0	0	0	0	0	0	0	0	899	0	0	0	0
° 58	0	0	0	0	0	0	0	0	0	635	0	0	0	0
° 59	0	0	0	0	0	0	0	0	0	366	0	0	0	0
° 60	0	0	0	0	0	0	0	0	0	5197	0	0	0	0
° 61	0	0	0	0	0	0	0	0	0	2871	0	0	0	0
° 62	0	0	0	0	0	0	0	0	0	3533	0	0	0	0
° 63	0	0	0	0	0	0	0	0	0	635	0	0	0	0
° 64	0	0	0	0	0	0	0	0	0	1329	0	0	0	0
° 65	0	0	0	0	0	0	0	0	0	899	0	0	0	0
° 66	0	0	0	0	0	0	0	0	0	5469	0	0	0	0
°														
°	43560	39204	11761	17642	9801	20000	4848	4363	34166	45721	11760	17639	34163	45721

IDS 2.01 30JUN92 >> CALC-20.SIL 19JAN96

APPENDIX E

TABLE 18

SILER CITY 1993 BASE YEAR TRIP LENGTH FREQUENCY

TIME (MIN)	HBW %	HBW TRIPS	OHB %	OHB TRIPS	NHB + S + C %	NHB + S + C TRIPS	E-I %	E-I TRIPS
1	1.94	152	3.30	388	9.00	1,750	0.00	0
2	13.72	1,075	10.36	1,218	18.70	3,637	2.09	587
3	19.85	1,556	20.36	2,393	24.20	4,707	8.39	2,356
4	21.36	1,674	23.57	2,771	21.00	4,084	10.37	2,912
5	17.84	1,398	20.29	2,385	17.00	3,306	12.96	3,640
6	10.82	848	13.20	1,552	3.80	739	13.44	3,774
7	8.32	652	4.32	508	1.30	253	11.20	3,145
8	2.14	168	1.56	183	1.20	233	10.44	2,932
9	1.36	107	1.04	122	1.00	194	9.07	2,547
10	0.78	61	0.72	85	0.80	156	7.29	2,047
11	0.60	47	0.48	56	0.60	117	6.44	1,809
12	0.49	38	0.32	38	0.50	97	4.64	1,303
13	0.47	37	0.24	28	0.40	78	2.36	663
14	0.19	15	0.16	19	0.40	78	0.77	216
15	0.10	8	0.08	9	0.10	19	0.37	104
16	0.02	2	0.00	0	0.00	0	0.15	42
17	0.00	0	0.00	0	0.00	0	0.02	6
TOTAL	100.00	7,837	100.00	11,755	100.00	19,449	100.00	28,084

TABLE 19

SILER CITY 2020 DESIGN YEAR TRIP LENGTH FREQUENCY

TIME (MIN)	HBW %	HBW TRIPS	OHB %	OHB TRIPS	NHB + S + C %	NHB + S + C TRIPS	E-I %	E-I TRIPS
1	1.94	228	3.30	582	9.00	3,075	0.00	0
2	13.72	1,614	10.36	1,828	18.70	6,389	2.09	956
3	19.85	2,335	20.36	3,592	24.20	8,268	8.39	3,836
4	21.36	2,512	23.57	4,158	21.00	7,175	10.37	4,741
5	17.84	2,098	20.29	3,580	17.00	5,808	12.96	5,925
6	10.82	1,273	13.20	2,329	3.80	1,298	13.44	6,145
7	8.32	979	4.32	762	1.30	444	11.20	5,121
8	2.14	252	1.56	275	1.20	410	10.44	4,773
9	1.36	160	1.04	183	1.00	342	9.07	4,147
10	0.78	92	0.72	127	0.80	273	7.29	3,333
11	0.60	71	0.48	85	0.60	205	6.44	2,944
12	0.49	58	0.32	56	0.50	171	4.64	2,121
13	0.47	55	0.24	42	0.40	137	2.36	1,079
14	0.19	22	0.16	28	0.40	137	0.77	352
15	0.10	12	0.08	14	0.10	34	0.37	169
16	0.02	2	0.00	0	0.00	0	0.15	69
17	0.00	0	0.00	0	0.00	0	0.02	9
TOTAL	100.00	11,761	100.00	17,642	100.00	34,166	100.00	45,721

TABLE 20
SILER CITY EXTERNAL STATION TRAFFIC VOLUMES

ROUTE	1960	1965	1970	1975	1980	1985	1990
SR1006N	2,500	3,150	4,250	5,300	6,200	6,500	1,900
US421N	---	---	---	---	---	---	5,400
SR1362	???	???	???	385	???	???	???
SR1004	???	???	1,250	1,200	1,000	???	2,400
SR1003	???	???	???	1,400	1,000	2,400	???
US64E	3,250	???	4,250	4,770	5,100	5,900	5,900
SR1503	???	???	???	???	80	???	???
SR2110	???	???	???	???	???	???	400
SR2113	???	???	90	130	150	???	200
US421S	---	---	3,700	4,250	5,100	6,300	7,600
SR1176	2,800	3,250	1,350	1,500	???	???	???
SR1006S	???	???	880	2,000	???	???	???
SR1132	???	???	???	160	200	???	300
SR1100	???	???	???	???	400	???	500
SR1102	???	???	300	???	500	???	600
US64W	2,950	3,400	4,400	4,400	5,100	5,900	4,500

All traffic volumes are measured in vehicles per day (vpd).

TABLE 21
SILER CITY EXTERNAL STATION TRAFFIC PROJECTIONS

ROUTE	ANNUALIZED GROWTH RATE 60->90	70->90	80->90	VOLUME 1993	PROJEC RATE	PROJEC 2020
SR1006N*	----	----	----	2,400	3.45	6,000
US421N	----	----	----	5,500	2.60	11,000
SR1362	????	????	????	840	3.27	2,000
SR1004	????	3.32	9.15	2,500	2.60	5,000
SR1003	????	????	????	2,200	2.24	4,000
US64E	2.01	1.65	1.47	6,800	2.13	12,000
SR1503	????	????	????	460	2.92	1,000
SR2110	????	????	????	300	3.19	700
SR2113	????	4.07	2.92	180	3.00	400
US421S	----	3.66	4.07	8,000	2.83	17,000
SR1176**	----	????	????	2,050	2.51	4,000
SR1006S	????	????	????	3,140	1.74	5,000
SR1132	????	????	4.14	350	2.60	700
SR1100	????	????	2.26	700	2.86	1,500
SR1102	????	3.53	1.84	650	1.61	1,000
US64W***	----	----	----	5,300	2.38	10,000

RATE is the annualized growth rate utilized in the compound interest formula. * was US421N prior to 1990 ** was US421S prior to 1970 *** had an abnormally low ADT in 1990 which would make growth rate calculations misleading

APPENDIX F

TABLE 22
SILER CITY 1993 BASE YEAR THROUGH TRIP MATRIX DEVELOPMENT

Population of the planning area: 8028

STATION	ADT	TRUCK %	CLASS	PTTDES	ADT/CD
1. SR1006N	2400	8	M	24.88	0.05798
2. US421N	5500	13	P	40.34	0.13287
3. SR1362	841	1	L	10.47	0.02032
4. SR1004	2500	2	J	16.26	0.06040
5. SR1003	2219	2	J	15.53	0.05361
6. US64E	6793	9	P	37.78	0.16411
7. SR1503	464	1	L	9.49	0.01121
8. SR2110	291	1	L	9.04	0.00703
9. SR2113	180	1	L	8.75	0.00435
10. US421S	8000	13	P	46.84	0.19327
11. SR1176	2056	8	J	23.99	0.04967
12. SR1006S	3145	7	M	25.34	0.07598
13. SR1132	350	1	L	9.19	0.00846
14. SR1100	704	1	L	10.11	0.01701
15. SR1102	650	1	L	9.97	0.01570
16. US64W	5300	9	P	33.90	0.12804

ROUTE CONTINUITY

2 to 10 : US421N to US421S
6 to 16 : US64E to US64W
10 to 2 : US421S to US421N
16 to 6 : US64W to US64E

UNBALANCED THROUGH TRIP END MATRIX:

0	159	5	32	27	184	3	2	1	283	40	49	2	4	4	125
90	0	12	69	58	429	6	4	2	1441	85	122	4	10	9	292
9	0	0	4	3	0	1	0	0	0	4	13	1	1	1	0
38	76	5	0	16	89	3	2	1	136	24	52	2	4	4	60
33	64	5	17	0	74	2	1	1	114	21	45	2	4	3	50
112	371	15	69	58	0	8	4	3	661	86	153	6	12	11	637
3	0	1	1	0	0	0	0	0	0	1	4	0	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
133	923	18	88	74	560	9	5	3	0	110	181	7	15	13	380
30	143	4	30	25	166	2	1	1	255	0	41	2	4	3	113
49	178	7	36	30	206	3	2	1	317	45	0	2	6	5	140
1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
7	0	1	2	2	0	1	0	0	0	3	9	0	0	1	0
6	0	1	2	2	0	1	0	0	0	3	8	0	1	0	0
86	304	12	57	48	860	6	3	2	541	72	118	4	10	9	0

TABLE 22
SILER CITY 1993 BASE YEAR THROUGH TRIP MATRIX DEVELOPMENT

DESIRED TOTALS:

597	2219	88	407	345	2567	44	26	16	3747	493	797	32	71	65	1797

FOLDED TRIP END MATRIX:

0															
124	0														
7	6	0													
35	73	4	0												
30	61	4	16	0											
148	400	8	79	66	0										
3	3	1	2	1	4	0									
1	2	0	1	1	2	0	0								
0	1	0	0	0	1	0	0	0							
208	1182	9	112	94	610	4	3	2	0						
35	114	4	27	23	126	1	1	0	182	0					
49	150	10	44	38	179	4	1	1	249	43	0				
1	2	1	1	1	3	0	0	0	3	1	2	0			
6	5	1	3	3	6	1	0	0	7	3	8	0	0		
5	5	1	3	3	6	1	0	0	7	3	7	0	1	0	
106	298	6	59	49	748	3	2	1	461	92	129	2	5	4	0

TOTALS FOR FOLDED TRIP END MATRIX:

758	2426	63	459	390	2387	27	14	8	3133	657	912	18	50	44	1964

FRATAR FACTORS FOR THE MATRIX:

0.787	0.915	1.403	0.886	0.883	1.075	1.605	1.916	1.970	1.196	0.751	0.874	1.798	1.437	1.458	0.915

TRIP END MATRIX AFTER ITERATION # 10 :

0															
77	0														
8	7	0													
22	47	5	0												
18	39	5	12	0											
118	337	12	74	62	0										
4	4	2	3	2	8	0									
1	3	1	2	1	6	1	0								
1	2	1	1	1	4	0	0	0							
220	1328	18	140	118	957	9	6	3	0						
18	61	4	16	14	94	1	1	0	156	0					
30	96	11	31	27	160	4	1	1	255	36	0				
2	3	1	2	1	6	1	0	0	8	1	4	0			
6	6	3	4	4	10	1	1	0	13	5	12	1	0		
5	5	2	4	3	9	1	1	0	12	4	10	1	2	0	
68	203	7	45	37	713	4	2	1	503	82	119	2	5	4	0

TABLE 22
SILER CITY 1993 BASE YEAR THROUGH TRIP MATRIX DEVELOPMENT

FRATAR FACTORS:

1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000

BALANCED THROUGH TRIP MATRIX:

0	39	4	11	9	59	2	1	0	110	9	15	1	3	3	34
39	0	4	24	20	168	2	2	1	664	30	48	2	3	3	102
4	4	0	3	2	6	1	1	0	9	2	6	1	1	1	4
11	24	3	0	6	37	1	1	0	70	8	16	1	2	2	22
9	20	2	6	0	31	1	1	0	59	7	13	1	2	2	19
59	168	6	37	31	0	4	3	2	478	47	80	3	5	5	356
2	2	1	1	1	4	0	0	0	4	1	2	0	1	1	2
1	2	1	1	1	3	0	0	0	3	0	1	0	0	0	1
0	1	0	0	0	2	0	0	0	2	0	0	0	0	0	1
110	664	9	70	59	478	4	3	2	0	78	127	4	7	6	252
9	30	2	8	7	47	1	0	0	78	0	18	1	2	2	41
15	48	6	16	13	80	2	1	0	127	18	0	2	6	5	60
1	2	1	1	1	3	0	0	0	4	1	2	0	0	0	1
3	3	1	2	2	5	1	0	0	7	2	6	0	0	1	2
3	3	1	2	2	5	1	0	0	6	2	5	0	1	0	2
34	102	4	22	19	356	2	1	1	252	41	60	1	2	2	0

COLUMN TOTALS:

300	1112	45	204	173	1284	22	14	6	1873	246	399	17	35	33	899

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TABLE 23
SILER CITY 2020 DESIGN YEAR THROUGH TRIP MATRIX DEVELOPMENT

Population of the planning area: 10635

STATION	ADT	TRUCK %	CLASS	PTTDES	ADT/CD
1. SR1006N	6000	8	M	33.43	0.07380
2. US421N	11000	13	P	53.83	0.13530
3. SR1362	2000	1	L	12.67	0.02460
4. SR1004	5000	2	J	21.95	0.06150
5. SR1003	4000	2	J	19.35	0.04920
6. US64E	12000	9	P	50.51	0.14760
7. SR1503	1000	1	L	10.07	0.01230
8. SR2110	700	1	L	9.29	0.00861
9. SR2113	400	1	L	8.51	0.00492
10. US421S	17000	13	P	69.43	0.20910
11. SR1176	4000	8	J	28.23	0.04920
12. SR1006S	5000	7	M	29.35	0.06150
13. SR1132	700	1	L	9.29	0.00861
14. SR1100	1500	1	L	11.37	0.01845
15. SR1102	1000	1	L	10.07	0.01230
16. US64W	10000	9	P	45.31	0.12300

ROUTE CONTINUITY

2 to 10 : US421N to US421S
6 to 16 : US64E to US64W
10 to 2 : US421S to US421N
16 to 6 : US64W to US64E

UNBALANCED THROUGH TRIP END MATRIX:

0	515	19	98	68	523	8	5	3	1106	102	117	5	13	8	382
313	0	36	180	126	1033	14	9	5	4087	188	226	9	24	14	755
42	25	0	18	12	25	2	1	1	53	18	31	1	4	2	18
133	268	16	0	40	272	6	4	2	576	60	96	4	11	6	199
103	197	13	46	0	200	5	3	2	423	48	74	3	8	5	146
344	972	40	173	121	0	16	10	5	2089	181	248	10	26	16	1377
12	0	2	6	4	0	0	1	0	0	6	9	1	2	1	0
3	0	1	2	2	0	1	0	0	0	2	2	0	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
494	2330	57	251	175	1469	22	14	7	0	262	356	14	38	22	1072
103	372	13	74	52	378	5	3	2	799	0	74	3	8	5	276
133	414	16	81	57	421	6	4	2	890	85	0	4	11	6	307
3	0	1	2	2	0	1	0	0	0	2	2	0	1	1	0
27	0	4	12	8	0	2	1	1	0	12	20	1	0	2	0
12	0	2	6	4	0	1	1	0	0	6	9	1	2	0	0
283	829	33	150	104	1741	13	8	4	1782	156	204	8	22	13	0

TABLE 23
SILER CITY 2020 DESIGN YEAR THROUGH TRIP MATRIX DEVELOPMENT

DESIRED TOTALS:

2006	5922	253	1098	774	6062	101	65	34	11804	1129	1468	65	171	101	4531

FOLDED TRIP END MATRIX:

0															
414	0														
31	31	0													
115	224	17	0												
85	161	12	43	0											
433	1003	32	223	160	0										
10	7	2	6	4	8	0									
4	5	1	3	2	5	1	0								
1	2	1	1	1	3	0	0	0							
800	3209	55	414	299	1779	11	7	4	0						
102	280	15	67	50	279	5	3	1	531	0					
125	320	23	88	65	334	8	3	1	623	79	0				
4	5	1	3	2	5	1	0	0	7	3	3	0			
20	12	4	11	8	13	2	1	0	19	10	15	1	0		
10	7	2	6	4	8	1	1	0	11	5	8	1	2	0	
332	792	26	174	125	1559	6	4	2	1427	216	256	4	11	6	0

TOTALS FOR FOLDED TRIP END MATRIX:

2488	6471	254	1396	1024	5844	72	40	18	9194	1647	1952	40	130	72	4941

FRATAR FACTORS FOR THE MATRIX:

0.806	0.915	0.997	0.787	0.756	1.037	1.399	1.616	1.941	1.284	0.686	0.752	1.616	1.315	1.399	0.917

TRIP END MATRIX AFTER ITERATION # 10:

0															
235	0														
20	20	0													
56	110	11	0												
40	75	8	20	0											
303	704	32	159	111	0										
12	8	4	7	5	12	0									
6	6	3	4	3	9	1	0								
2	4	1	2	1	6	1	0	0							
981	3951	94	519	363	2960	26	17	10	0						
44	121	9	30	21	163	4	2	1	443	0					
60	155	16	44	31	219	7	3	1	585	57	0				
5	6	2	4	3	8	1	1	0	17	5	6	0			
20	12	5	11	8	18	3	2	1	36	15	23	2	0		
10	7	3	6	5	11	2	1	0	23	8	12	1	3	0	
211	506	23	113	79	1345	8	5	3	1761	204	248	4	12	7	0

TABLE 23
SILER CITY 2020 DESIGN YEAR THROUGH TRIP MATRIX DEVELOPMENT

FRATAR FACTORS:

1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.002	1.000	1.000	1.001	1.001	1.001	1.001

BALANCED THROUGH TRIP MATRIX:

0	118	10	28	20	151	6	3	1	490	22	30	2	10	5	106
118	0	10	55	38	352	4	3	2	1976	61	78	3	6	4	253
10	10	0	6	4	16	2	1	1	47	5	8	1	3	2	11
28	55	6	0	10	80	4	2	1	259	15	22	2	6	3	57
20	38	4	10	0	55	3	2	1	182	11	16	1	4	2	39
151	352	16	80	55	0	6	5	3	1480	82	110	4	9	6	673
6	4	2	4	3	6	0	1	0	13	2	3	1	1	1	4
3	3	1	2	2	5	1	0	0	9	1	2	0	1	1	3
1	2	1	1	1	3	0	0	0	5	0	1	0	0	0	1
490	1976	47	259	182	1480	13	9	5	0	222	292	8	18	11	880
22	61	5	15	11	82	2	1	0	222	0	29	2	8	4	102
30	78	8	22	16	110	3	2	1	292	29	0	3	11	6	124
2	3	1	2	1	4	1	0	0	8	2	3	0	1	1	2
10	6	3	6	4	9	1	1	0	18	8	11	1	0	1	6
5	4	2	3	2	6	1	1	0	11	4	6	1	1	0	3
106	253	11	57	39	673	4	3	1	880	102	124	2	6	3	0

COLUMN TOTALS:

1002	2963	127	550	388	3032	51	34	16	5892	566	735	31	85	50	2264

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TABLE 24

SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION	EXISTING CROSS SECTION				EXISTING CAPACITY	AVERAGE WEEKDAY TRAFFIC		RECOMMENDED CROSS SECTION				FUTURE CAPACITY
from--to	DIS mi	LAN num	PAV ft	ROW ft	vpd	1993 vpd	2020 vpd	DIS mi	LAN num	PAV fig	ROW ft	vpd
AIRPORT ROAD (SR1100)												
Hal Clark--Blair Field	1.1	2	20	60	11,000	650	1,530	1.1	2	ADQ	ADQ	11,000
Blair Field--Brower Rd	0.5	2	20	60	11,000	950	3,361	0.5	2	K	60	13,000
Brower Road--Brower Rd	0.5	2	20	60	11,000	1,000	2,646	0.5	2	K	60	13,000
Brower Road--West Third	0.6	2	20	60	11,000	1,300	3,927	0.6	2	K	60	13,000
West Third--West Eleven	0.7	---	---	---	------	-----	2,605	0.7	2	K	100	13,000
West Eleventh--Hamp Sto	0.5	---	---	---	------	-----	3,128	0.5	2	K	100	13,000
Hamp Stone--Old US421N	0.6	---	---	---	------	-----	2,591	0.6	2	K	100	13,000
ALSTON BRIDGE (SR2110)												
South Second--College	0.9	2	20	60	11,000	2,540	3,661	0.9	2	ADQ	ADQ	11,000
College St Ext--SR2211	0.5	2	20	60	11,000	1,500	2,570	0.5	2	ADQ	ADQ	11,000
SR2211--PAB	0.7	2	16	60	8,000	290	1,011	0.7	2	ADQ	ADQ	8,000
BISH ROAD (SR1105)												
Connector--Old US421N	0.4	2	18	60	9,000	900	1,171	0.4	2	ADQ	ADQ	9,000
BISH-STOCKYARD CONNECT												
Stockyard Rd--Bish Road	0.4	---	---	---	------	-----	762	0.4	2	K	70	13,000
BROWER ROAD (SR1120)												
Coleridge--Airport Road	0.7	---	---	---	------	-----	977	0.7	2	K	70	13,000
Airport--Brower-Paschal	0.4	2	20	60	11,000	200	1,414	0.4	2	ADQ	ADQ	11,000
BROWER-PASCHAL CONNECT												
Brower--Wade Paschal Rd	0.4	---	---	---	------	-----	1,276	0.4	2	K	70	13,000

Table 24
SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION	EXISTING CROSS SECTION				EXISTING CAPACITY	AVERAGE WEEKDAY TRAFFIC		RECOMMENDED CROSS SECTION				FUTURE CAPACITY
	DIS	LAN	PAV	ROW		1993	2020	DIS	LAN	PAV	ROW	
from--to	mi	num	ft	ft	vpd	vpd	vpd	mi	num	fig	ft	vpd
CHATHAM AVENUE (SR1108)												
[HAMP STONE ROAD]												
Fayetteville--Third St	0.6	2	36	50	12,500	4,300	5,000	0.6	2	ADQ	ADQ	12,500
Third St--Fifth Street	0.1	2	18	50	8,500	1,914	2,500	0.1	2	ADQ	ADQ	8,500
Fifth Str--Eleventh St	0.6	2	18	50	8,500	1,400	2,000	0.6	2	ADQ	ADQ	8,500
Eleventh--Sears Extensi	0.2	2	18	40	9,000	800	1,286	0.2	2	ADQ	ADQ	9,000
Sears Extension--Dogwoo	0.3	2	18	40	9,000	796	2,760	0.3	2	ADQ	ADQ	9,000
Dogwood Exten--Old 421N	1.2	2	18	60	9,000	650	3,959	1.2	2	ADQ	ADQ	9,000
SOUTH CHATHAM AVENUE												
EXTENSION (SR2113)												
US421--South Second Ave	0.7	2	24	120	13,000	2,451	5,124	0.7	2	ADQ	ADQ	13,000
South Second--City Limi	1.3	4	48	120	50,000	4,300	5,969	1.3	4	ADQ	ADQ	50,000
City Limit--South Chath	0.5	4	48	80	39,000	5,061	2,702	0.5	4	ADQ	ADQ	39,000
COLERIDGE ROAD (SR1102)												
PAB--West Third	1.6	2	18	60	9,000	936	1,445	1.6	2	ADQ	ADQ	9,000
West Third--Ellington	0.5	---	---	---	------	-----	2,453	0.5	2	K	70	13,000
COLLEGE STREET *												
Chatham Exten--South Se	0.4	2	18	NA	9,000	unknown	4,188	0.4	2	ADQ	ADQ	9,000
South Second--Alston Br	0.6	---	---	---	------	-----	3,547	0.6	2	K	100	13,000
DOGWOOD AVENUE												
Sunview Exten--West Elk	0.4	---	---	---	------	-----	2,000	0.4	2	K	70	13,000
West Elk--West Raleigh	0.3	2	22	30	11,500	1,500	2,000	0.3	2	ADQ	ADQ	11,500
West Raleigh--West Thir	0.2	2	20	30	10,500	3,338	3,600	0.2	2	ADQ	ADQ	10,500
West Third--West Fifth	0.2	2	24	30	12,500	1,500	1,727	0.2	2	ADQ	ADQ	12,500
West Fifth--West Eleven	0.6	2	18	40	8,500	843	2,267	0.6	2	ADQ	ADQ	8,500
West Eleventh--Chatham	0.3	---	---	---	------	-----	1,603	0.3	2	K	70	13,000

APPENDIX G

TABLE 24

SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION from--to	EXISTING CROSS SECTION DIS mi	LAN num	PAV ft	ROW ft	EXISTING CAPACITY vpd	AVERAGE WEEKDAY TRAFFIC 1993 vpd	2020 vpd	RECOMMENDED CROSS SECTION DIS mi	LAN num	PAV fig	ROW ft	FUTURE CAPACITY vpd
DRIFTWOOD DRIVE(SR1184)												
Ellington--dead end	0.5	---	---	---	------	-----	800	0.5	2	K	70	12,000
dead end--North Garden	0.4	2	20	60	10,500	443	800	0.4	2	ADQ	ADQ	10,500
ELEVENTH STREET (US64)												
[ASHEBORO HIGHWAY]												
[PITTSBORO HIGHWAY]												
Moons Chapel--West Thir	0.7	2	22	150	12,000	5,300	9,997	0.7	4	F	200	50,000
West Third--Ellington	1.2	2	22	150	12,000	6,030	6,061	1.2	4	F	200	50,000
Ellington--North Dogwoo	1.3	2	22	150	12,000	7,700	9,248	1.3	4	F	200	50,000
North Dogwood--Cottage	0.4	2	22	150	12,000	7,700	11,138	0.4	5	C	200	39,000
Cottage Grove--Martin L	0.6	5	68	100	39,000	9,800	15,795	0.6	5	ADQ	ADQ	39,000
Martin Luther--East Thi	0.6	5	68	100	39,000	10,896	20,302	0.6	5	ADQ	ADQ	39,000
East Third--US421 Frwy	0.5	5	68	100	39,000	13,900	24,178	0.5	5	ADQ	ADQ	39,000
US421--Pearlyman Teague	0.1	5	68	100	39,000	9,000	18,927	0.1	5	ADQ	ADQ	39,000
Pearlyman Teague--Silk	0.9	2	22	100	12,000	8,800	17,650	0.9	4	F	200	50,000
Silk Hope--Marsh Creek	0.6	2	22	100	12,000	6,793	12,005	0.6	4	F	200	50,000
ELK STREET												
SR 1006--SR1108	0.5	2	18	NA	9,000	776	1500	0.5	2	ADQ	ADQ	9,000
SR 1108--SR2208	0.1	---	---	---	--	--	1500	0.1	2	K	60	13,000
SR2208--South 6th	0.1	2	18	NA	9,000	NA	1500	0.1	2	ADQ	ADQ	9,000
ELLINGTON ROAD (SR1106)												
Driftwood-Coleridge Ext	0.3	2	22	60	12,000	1,200	800	0.3	2	ADQ	ADQ	12,000
Coleridge Ext--Bish Ext	1.1	2	22	60	12,000	1,200	1700	1.1	2	ADQ	ADQ	12,000
FAYETTEVILLE AV(SR2113)												
Chatham--South Second	0.3	4	44	60	39,000	3,296	2,994	0.3	4	ADQ	ADQ	39,000

TABLE 24
SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION from--to	EXISTING CROSS SECTION DIS mi	LAN num	PAV ft	ROW ft	EXISTING CAPACITY vpd	AVERAGE WEEKDAY TRAFFIC 1993 vpd	AVERAGE WEEKDAY TRAFFIC 2020 vpd	RECOMMENDED CROSS SECTION DIS mi	LAN num	PAV fig	ROW ft	FUTURE CAPACITY vpd
FIFTH STREET												
West Third--Glenn Ave	0.1	---	---	---	------	-----	2,653	0.2	2	K	70	12,000
Glenn--North Dogwood	0.5	2	18	40	8,500	unknown	2,000	0.5	2	ADQ	ADQ	8,500
North Dogwood--North Se	0.3	2	18	40	8,500	2,091	3,500	0.3	2	ADQ	ADQ	8,500
GEES GROVE ROAD(SR2114)												
Old US421S--South Chath	1.3	2	18	60	9,000	200	126	1.3	2	ADQ	ADQ	9,000
GREENSBORO AVE (SR1317)												
North Second--East Elev	0.3	2	35	40	12,500	4,600	5,833	0.3	2	ADQ	ADQ	12,500
East Eleventh--East Sea	0.2	2	22	60	11,500	4,500	4,414	0.2	2	ADQ	ADQ	11,500
East Sears--Harold Andr	0.3	2	22	60	11,500	4,300	3,010	0.3	2	ADQ	ADQ	11,500
Harold Andrews--Old421N	0.1	2	22	60	11,500	3,000	1,570	0.1	2	ADQ	ADQ	11,500
HAROLD ANDREWS (SR1316)												
Greensboro--Richardson	0.2	2	18	60	9,000	1,300	1,440	0.2	2	ADQ	ADQ	9,000
Richardson--Siler Mill	1.7	2	18	60	9,000	1,000	2,197	1.7	2	ADQ	ADQ	9,000
MARTIN LUTHER KING JR BOULEVARD (SR2100/1004) [SILER MILL ROAD]												
North Second--South 6th	0.4	3	44	60	20,000	4,298	6,700	0.4	3	ADQ	ADQ	20,000
South Sixth --East Elev	0.2	3	44	60	20,000	4,298	12,001	0.2	3	ADQ	ADQ	20,000
East Eleventh--City Lim	0.5	2	20	50	10,500	4,700	2,354	0.5	2	ADQ	ADQ	10,500
City Limit--Pearlyman	0.9	2	20	60	11,000	2,316	2,756	0.9	2	ADQ	ADQ	11,000
Pearlyman--Harold Andre	0.6	2	20	60	11,000	2,000	3,531	0.6	2	ADQ	ADQ	11,000
Harold Andrews--Rock Ri	0.1	2	20	60	11,000	2,500	4,998	0.1	2	ADQ	ADQ	11,000

APPENDIX G

TABLE 24

SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION	EXISTING CROSS SECTION				EXISTING CAPACITY	AVERAGE WEEKDAY TRAFFIC		RECOMMENDED CROSS SECTION					FUTURE CAPACITY
	DIS	LAN	PAV	ROW		1993	2020	DIS	LAN	PAV	ROW		
from--to	mi	num	ft	ft	vpd	vpd	vpd	mi	num	fig	ft		vpd
NORTHEAST THIRD STREET													
SR1004--Alston Street	0.1	2	18	30	9,000	UNKNOWN	2,900	0.1	2	ADQ	ADQ		9,000
Alston Street--Sears St	0.1	--	--	--	--	--	2,900	0.1	2	K	100		12,000
NORTH GLEN AVENUE													
SR1108--11TH	0.3	---	---	---	------	-----	700	0.3	2	K	70		10,500
11TH--West 6TH	0.7	2	20	40	10,500	unknown	1,200	0.7	2	ADQ	ADQ		10,500
West 6TH--West 5TH	0.1	---	---	---	------	-----	2,000	0.1	2	K	70		10,500
NORTH SECOND AV(SR1006)													
[OLD US421 NORTH HWY]													
East Raleigh--East Fift	0.3	5	64	70	35,000	8,200	13,797	0.3	5	ADQ	ADQ		35,000
East Fifth--Greensboro	0.2	4	44	60	33,000	7,762	15,213	0.2	4	ADQ	ADQ		33,000
Greensboro--Greensboro	0.8	4	44	60	33,000	2,700	9,198	0.8	4	ADQ	ADQ		33,000
Greensboro--Piney Grove	0.5	2	22	70	11,500	5,951	9,617	0.5	2	ADQ	ADQ		11,500
Piney Grove Church--Poe	2.6	2	22	70	12,000	2,400	5,987	2.6	2	ADQ	ADQ		12,000
OAKLEY CHURCH (SR1130)													
Airport--SR1006	2.3	2	20	60	11,000	340	864	2.3	2	ADQ	ADQ		11,000
SR1006--SR1176	1.9	---	---	---	------	-----	846	1.9	2	K	70		13,000
OLD US421S ROAD(SR1176)													
Gees Grove--South Chath	1.3	2	22	60	12,000	2,056	4,784	1.3	2	ADQ	ADQ		12,000
PARK DRIVE (SR1115) *													
West Third--Sunset Driv	0.1	2	16	???	7,000	unknown	6,032	0.1	2	ADQ	ADQ		7,000
Sunset Dr--West Raleigh	0.7	---	---	---	------	-----	6,032	0.7	2	K	100		12,000

TABLE 24
SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION	EXISTING CROSS SECTION				EXISTING CAPACITY	AVERAGE WEEKDAY TRAFFIC		RECOMMENDED CROSS SECTION				FUTURE CAPACITY
	DIS	LAN	PAV	ROW		1993	2020	DIS	LAN	PAV	ROW	
from--to	mi	num	ft	ft	vpd	vpd	vpd	mi	num	fig	ft	vpd
PINEY GROVE CH (SR1362)												
Old US421N--US421 Frwy	0.9	2	20	60	12,000	1,830	4,073	0.9	2	K	60	13,000
US421 Frwy--ETJ Limit	0.8	2	20	60	12,000	842	2,030	0.8	2	ADQ	ADQ	12,000
PONY FARM ROAD *												
Alston Bridge--Wayne Dr	0.9	---	---	---	------	-----	5,118	0.9	2	K	100	13,000
RALEIGH ST(SR1006/2103)												
[SILER CITY GLENDON RD]												
Oakley Church--Country	1.7	2	22	60	12,000	3,145	5,175	1.7	2	ADQ	ADQ	12,000
Country Club--Wade Pasc	0.4	2	22	60	12,000	3,451	8,514	0.4	2	ADQ	ADQ	12,000
Wade Paschal--Sunview	0.3	2	22	60	12,000	3,451	8,967	0.3	2	ADQ	ADQ	12,000
Sunview--Lakewood Drive	0.4	2	22	60	12,000	4,745	6,757	0.4	2	ADQ	ADQ	12,000
Lakewood--Dogwood Ave	0.4	3	44	60	20,000	5,100	8,275	0.4	3	ADQ	ADQ	12,000
Dogwood Avenue--Third	0.4	2	44	50	12,500	5,100	7,970	0.4	3	ADQ	ADQ	20,000
Third Avenue--Seventh	0.3	2	30	40	12,500	6,017	7,796	0.3	3	H	60	20,000
Seventh Av--Eleventh St	0.9	2	20	50	10,500	5,515	9,526	0.9	3	H	60	20,000
RICHARDSON RD (SR1384)*												
Old US421N--Siler Mill	0.9	---	---	---	------	-----	5,217	0.9	2	K	100	13,000
Siler Mill Rd--dead end	0.4	2	20	60	12,000	unknown	2,437	0.4	2	ADQ	ADQ	12,000
RICHARDSON-WAYNE CON *												
Richardson--Eleventh St	0.6	---	---	---	------	-----	2,437	0.6	2	K	100	13,000
SAM FIELDS ROAD(SR2113)												
US421 Frwy--Feaster Rd	0.6	2	22	120	12,000	180	442	0.6	2	ADQ	ADQ	12,000

APPENDIX G

TABLE 24

SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION	EXISTING CROSS SECTION				EXISTING CAPACITY	AVERAGE WEEKDAY TRAFFIC		RECOMMENDED CROSS SECTION					FUTURE CAPACITY
	DIS	LAN	PAV	ROW		1993	2020	DIS	LAN	PAV	ROW		
from--to	mi	num	ft	ft	vpd	vpd	vpd	mi	num	fig	ft		vpd
SEARS STREET													
SR1108--SR1317	0.3	---	---	---	------	-----	5,200	0.3	2	K	100		12,000
SR1317--For 0.2 Miles	0.2	2	18	30	9,000	276	2,900	0.2	ADQ	ADQ	ADQ		9,000
SILK HOPE ROAD (SR1003)													
US 64--SR1502	0.8	2	18	60	9,000	1,500	5,000	0.8	2		ADQ	ADQ	9,000
SIXTH AVENUE													
SR2100--East Third	0.1	---	---	---	------	-----	6,300	0.1	2	K	100		12,000
E. Third--Alston Bridge	0.6	2	18	40	9,000	1,076	5,000	0.6	2		ADQ	ADQ	9,000
SOUTH SECOND AVENUE													
(SR2208/SR2113)													
Chatham Ext--College	1.2	2	20	60	11,000	247	927	1.2	2		ADQ	ADQ	11,000
College--Alston Bridge	0.4	2	18	60	9,000	2,571	7,552	0.4	2		ADQ	ADQ	9,000
Alston Bridge--South Si	0.1	2	26	60	12,500	3,512	11,213	0.1	2		ADQ	ADQ	12,500
South Sixth--Fayettevil	0.2	2	22	50	11,500	2,000	5,973	0.2	2		ADQ	ADQ	11,500
Fayetteville--East Rale	0.2	4	44	60	39,000	5,997	8,836	0.2	4		ADQ	ADQ	39,000
SUNVIEW DRIVE *													
West Raleigh--dead end	0.2	2	16	30	7,000	unknown	6,856	0.2	2		ADQ	ADQ	7,000
dead end--Chatham Exten	0.5	---	---	---	------	-----	7,455	0.5	2	K	100		13,000

TABLE 24

SILER CITY THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS (ENGLISH UNITS)

ROADWAY SECTION	EXISTING CROSS SECTION				EXISTING CAPACITY	AVERAGE WEEKDAY TRAFFIC		RECOMMENDED CROSS SECTION				FUTURE CAPACITY
	DIS	LAN	PAV	ROW		1993	2020	DIS	LAN	PAV	ROW	
from--to	mi	num	ft	ft	vpd	vpd	vpd	mi	num	fig	ft	vpd
THIRD STREET (SR1107)												
[OLD US64 HIGHWAY]												
Asheboro Hwy--Airport	1.7	2	22	60	12,000	2,271	6,490	1.7	ADQ	ADQ	ADQ	12,000
Airport Road--Park Driv	0.4	2	22	60	12,000	4,769	9,321	0.4	3	H	60	20,000
Park Drive--North Holly	0.5	2	22	60	12,000	5,316	7,184	0.5	3	H	60	20,000
North Holly--North Chat	0.5	2	30	40	11,500	6,539	8,361	1.5	3	H	60	20,000
North Chatham--North Se	0.1	2	36	40	11,500	6,248	8,361	0.1	3	H	60	20,000
North Second--North Six	0.4	2	26	50	11,500	6,539	15,850	0.4	5	C	90	39,000
North Sixth--Eleventh	0.7	2	26	50	11,500	5,077	8,191	0.7	3	H	60	20,000
US421												
SR2210--SR2113	0.9	4	48	200	60,000	7,800	17,000	0.9	ADQ	ADQ	ADQ	60,000
SR2113--US64	3.8	4	48	380	60,000	5,500	12,000	3.8	ADQ	ADQ	ADQ	60,000
US64--PAB	2.4	4	48	200	60,000	7,800	14,000	2.4	ADQ	ADQ	ADQ	60,000
WADE PASCHAL RD(SR1119)												
Brower-Paschal--West Ra	0.7	2	16	60	8,000	453	1,799	0.7	2	K	60	13,000
WAYNE DRIVE *												
Eleventh--dead end	0.1	---	0	30	5,000	unknown	5,118	0.1	2	K	60	13,000
WEST 9TH Street												
N. Dogwood-N. Fir	0.1	2	20	NA	10,500	unknown	800	0.1	2	ADQ	NA	10,500
N. Fir-N. Garden Ave.	0.1	---	---	---	--	--	800	0.1	2	K	60	13,000

ABBREVIATIONS

PAB = Planning Area Boundary; ft = feet; PAV = pavement; * part of the Siler City Inner Loop project; mi = miles; ROW = right-of-way; ADQ = adequate; num = number; fig = figure; NA = Not Available; DIS = distance; vpd = vehicles per day; LAN = lanes

APPENDIX H

THOROUGHFARE CROSS SECTIONS

CROSS SECTION DESCRIPTIONS

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in Figure 23. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way. The recommended typical cross sections for the thoroughfares are given in Appendix G along with other pertinent information.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed in Appendix G. Recommendations for "ultimate" cross sections are provided for (1) thoroughfares which may require widening after the current planning period; (2) for thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient; and (3) for thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to maximum and minimum grades, minimum sight distances, maximum degree of curve and related super elevation, and other considerations for thoroughfares are given in Appendix B. This Appendix gives definitions and design standards recommended for inclusion in subdivision regulations.

Cross Sections A and L are typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending upon cut and fill requirements.

Cross Section B, seven lane curb and gutter, should not be used for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

Cross Section C, five lane curb and gutter, is typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross Sections D, E and M are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections. The 4.9 m (16 ft) median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance costs and an increased danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

Cross Section F is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24 ft) is recommended with 9.1 m (30 ft) being desirable.

Cross Section G is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require Cross Section H. Cross Sections I and J are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

Cross Section K is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares, projected traffic volumes may indicate that two

travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m (100 ft). In those cases, 21 m (70 ft) should be preserved with the understanding that the full 30 m (100 ft) will be preserved by use of building setbacks and future street line ordinances.

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross Sections N, O and P are typically used to accommodate bicycle travel.

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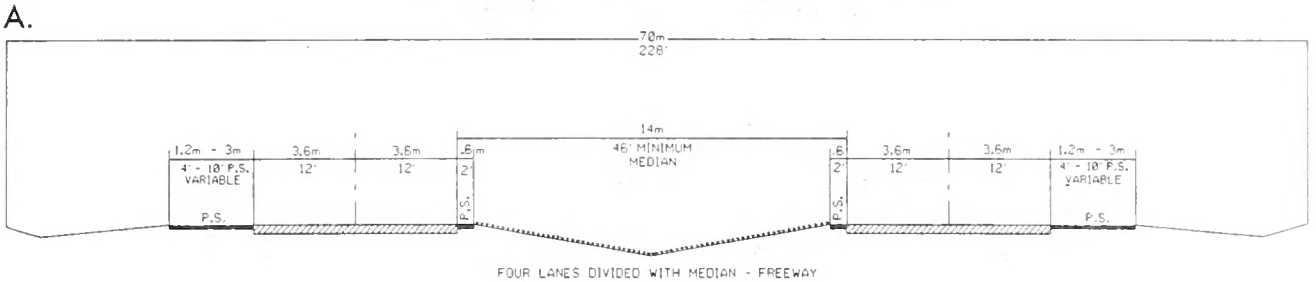
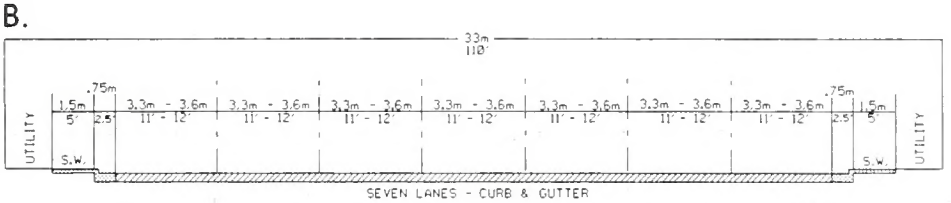
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



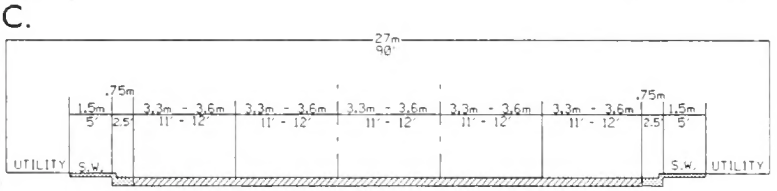
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



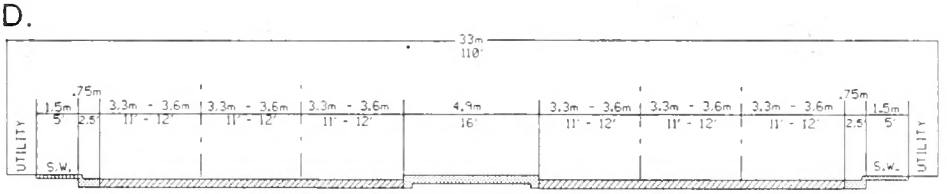
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

D.

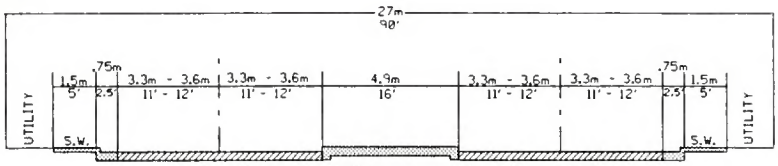


SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE 23

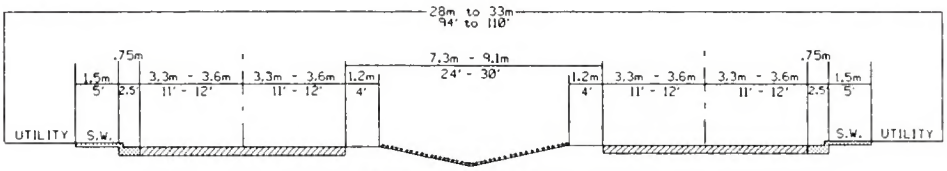
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



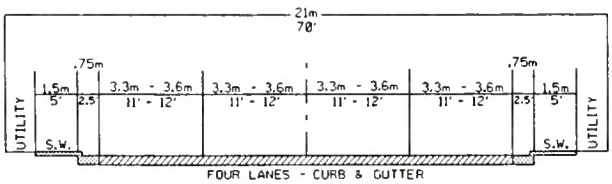
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



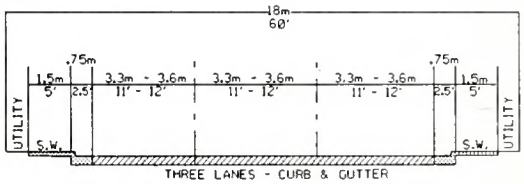
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



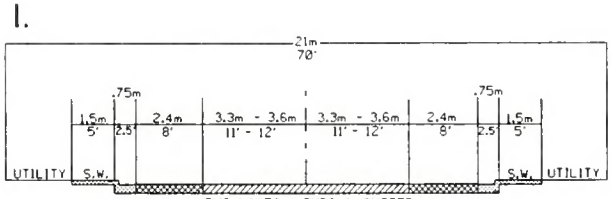
FOUR LANES - CURB & GUTTER

H.



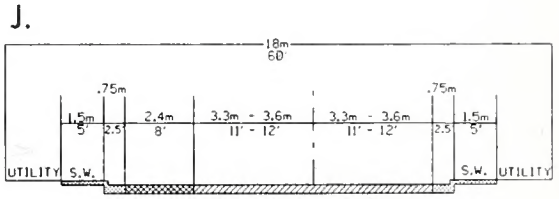
THREE LANES - CURB & GUTTER

I.



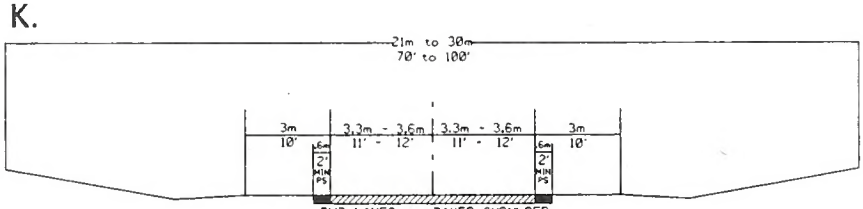
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

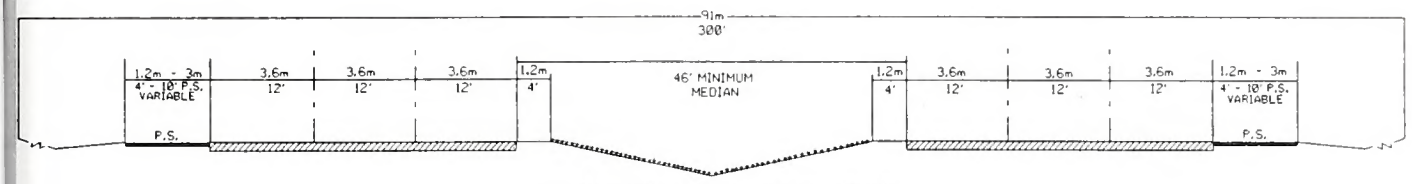
K.



TWO LANES - PAVED SHOULDER

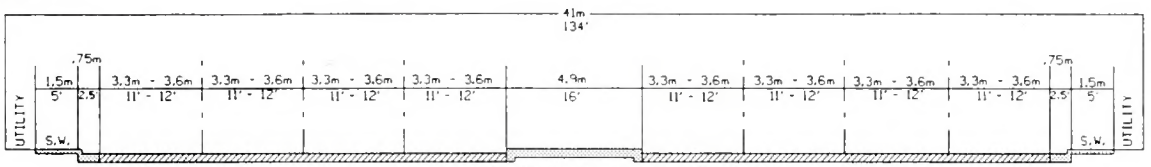
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

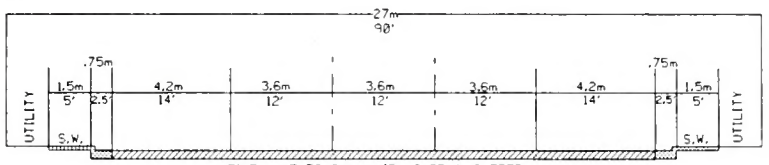
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

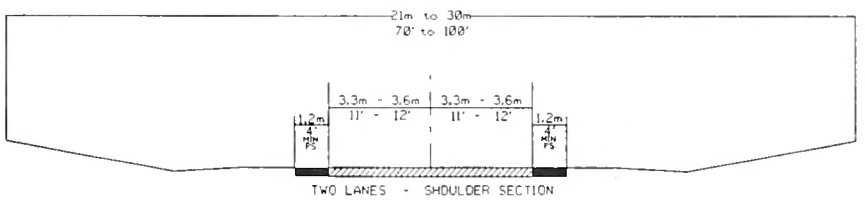
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



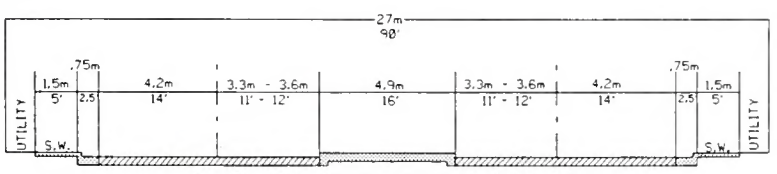
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

APPENDIX I

PUBLIC INVOLVEMENT

MEETINGS LISTING

Siler City Planning Board (presentations to): 13 September 1993, 11 October 1993, 13 March 1995, 8 May 1995, 30 October 1995, 22 January 1996, 26 February 1996

Siler City Commissioners Board (presentations to): 16 August 1993, 4 March 1996, 18 March 1996

Public Meetings (informal sessions):
15 February 1996, 18 March 1996

Public Hearing (formal event):
18 March 1996

City planning board sets growth goals for road plans

By Milburn Gibbs

"Expected population growth" is projected for Siler City through the year 2020.

The Siler City Planning Board, at its meeting Monday, had to decide — to help N.C. Department of Transportation's (NCDOT) Thoroughfare plan — what the growth rate in town would likely be through the year 2020.

Planning and Community Development Director James "Hank" Graham told the need for an accurate projection to the board, offering them three options — low growth of 2.5%; medium growth of 5.0% or high growth of 7.5%.

Members Byron Oldham and Cindy Edwards both spoke in favor of adopting the high growth figure for planning purposes. The board agreed.

If this growth rate is realized, Siler City would have a population of approximately 11,460 by 2020, including over 7800 jobs, which projects an net increase of about 500 jobs per decade.

NCDOT's Thoroughfare plan and study area (TPSA) includes a little more than the city limits of the town, but less than the Matthews Township.

The Hispanic population of the town was not included in the projections as Graham had no figures on which to base any estimates, thus the figures may be fairly far off if the continued in-migration continues.

Planning is a complicated pro cess, Graham noted, and an edu cated guess is about as close as on can reasonably come.

"We do need a comprehensiv plan," Graham said. "These projec

(See 'City', Page 15-A)

City

(Continued from Page A-1)

tions are very difficult without one."

[Ed. note: A detailed explaination of the Comprehensive Plan will be forthcoming in the coming weeks.]

As regards future annexations into the town, Graham said it "looks very, very expensive."

Homewood Acres Phase VII project looks "extremely good" according to Terry Green, Siler City Director of Public Works and Utilities.

Developer Ernie Evans was present at the meeting and stated he would have all targeted projects complete "as soon as it dries out enough to plant grass."

Both Green and Graham noted that nearly everything they required was complete.

Chatham News/Record, Thursday, June 15, 1995 15-A

Planning board okays houses, wants business signs to be moved

By Milburn Gibbs

Most of the Planning Board's interest Monday concerned a conditional use permit Richard Fox had applied for to build 14 single-family homes on approximately 3.25 acres he owns on US 64 between Fourth Avenue and East Ninth Street.

In answer to several board questions, Fox said his plans were to construct a new 20-foot street (10th Street) with curbs of wedge asphalt. The requirements are for an 18-foot street or larger.

A motion to approve the permit was approved on conditions that a neighbor, Mrs. Siler, be protected from water run-off caused by the project and that a vegetative buffer be erected along US 64.

The permit will now be submitted to the Town Board at its next meeting.

Prior to the regular meeting, Peter Slipp of North Carolina Department of Transportation (NCDOT) sought input from the board as to potential street needs the town might have. It has been over 15 years since the Thoroughfare Plan

(See 'Town', Page 13-A)

Town

(Continued from Page A-1)

was updated, much longer than NCDOT likes.

Siler City Director of Planning, James "Hank" Graham, said it was not necessary to adopt an official zoning map.

On the continuing matter of temporary and portable signs — which have been illegal since 1993 — there was disagreement among the board as to what to do about them. On a motion by member Cindy Edwards, the board approved a recommendation to the town board that these signs be amortized within 60 days.

The ordinance prohibiting them is listed on page 169, subtitles *d* and *e* of Section 257, of the Siler City Unified Development Ordinance.

Graham was seeking clarification as to how to enforce the ordinance already on the books.

Graham announced there would be a meeting to review the Historic Preservation Ordinance on January 30 at the Courtroom.

Edwards said that Graham "has done a wonderful job putting the ordinance together."

The Board of Adjustment met Monday night also, but what business was conducted will be rescheduled to a special meeting Thursday January 25 because an 80 per cent attendance is required for a quorum. Only five board members were present; six are needed.

Chatham News/Record, Thursday, January 25, 1996 13-A

Chatham News/Record, Thursday, February 1, 1996 5-B

SILER CITY
THOROUGHFARE PLAN
PUBLIC HEARING NOTICE

The Town of Siler City will conduct a Public Hearing on the Town's proposed Thoroughfare Plan. Hearing comments will be taken, on a drop-in basis, between the hours of 4:00 p.m. and 8:00 p.m. on Thursday, February 15, 1996, at City Hall located at 311 N. Second Avenue, Siler City, NC. The Public Hearing is to solicit oral and written comments from interested parties on the proposed Town Thoroughfare Plan.

Maps will be available for citizens to draw in potential future roads and express other traffic circulation points of view. You do not have to attend the hearing for four hours, just come to City Hall at your convenience during the specified time period, leave your comments and leave. North Carolina Department of Transportation staff will be available to answer any questions you may have and other pertinent information will be available. The Thoroughfare Planning process is necessary for the Town of Siler City to be able to apply and compete for State Transportation Funds for both minor and major road construction projects.

If you can not attend the Public Hearing, you can submit written comments to the Siler City Planning and Community Development Department, PO Box 769, Siler City, NC 27344. Written comments should be received no later than 5:00 p.m., Friday, February 16, 1996.

Chatham News/Record, Thursday, February 8, 1996 13-B

SILER CITY
THOROUGHFARE PLAN
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Public hearing Thursday on Siler City's road plan

By Bob Wachs

Siler City residents interested in how the motorists get around town may want to take advantage of a public hearing this week.

That session is being planned on a "drop-in" basis Thursday (Feb. 15) between 4 p.m. and 8 p.m. at City Hall. Its purpose is to receive both oral and written comments from interested persons on the proposed town Thoroughfare Plan.

"It's basically a planning tool," town manager Joel Brower said. "We have a plan in place and this is an opportunity to revise it."

At the meeting, maps will be available for citizens to draw in potential future roads. Members of the public are also asked to express their points of view about traffic circulation and flow in town.

"You don't have to attend the meeting for four hours," Brower said. "We just want people to come when they can during those hours and make their comments. They may leave once they've done that."

Officials of the N.C. Department of Transporation will be on hand

(See 'Roads', page 11-A)

Chatham News/Record, Thursday, February 15, 1996 11-A

Roads

(Continued from page A-1)

to answer questions. One important reason to have such a plan is that its necessary for the town to be able to apply and compete for State Transportation Funds for both minor and major road construction projects.

"The thoroughfare plan," Brower said, "is an overall planning document to tie traffic together. We want to look at growth patterns so we can avoid bottlenecks." Brower said Planning Director Hank Graham had produced a wide range of data dealing with traffic counts and patterns in the town and that those figures would be available for study.

Brower said an example of what the Thoroughfare Plan could mean to the town was the current study by DOT of a road connecting the Piney Grove Road with Airport Road. "That road is on our plan," Brower said, "and now it's undergoing a feasibility study by the state."

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Town leaves thoroughfare plan as is

By Milburn Gibbs

The Siler City Planning Board met Monday night to hear the Thoroughfare Plan from Peter Slipp of the North Carolina Department of Transportation (NCDOT) and to wish the town's departing planning director well.

Slipp presented a compilation of data furnished him over several years concerning the Thoroughfare Plan for the Town of Siler City.

"In order for Mary Hayes Holmes — County Representative to NCDOT — to recommend a project to DOT or to put projects on the State Transportation Improvement Plan, she has to have a thoroughfare plan adopted beforehand," Director of Planning James "Hank" Graham said. "Ms. Holmes has done a wonderful job for Siler City and the county."

The purpose of a thoroughfare plan is to consider existing and future land development plans and to try to accommodate the traffic circulation around it.

Examples of projects made possible by such a plan are the "Airport Loop" which is already in NCDOT's budget and the "Inner Loop" that will connect the Alston Bridge Road with U.S. 64 near Loves Creek Mobile Home Park on the east side of town.

"The plan is a policy tool that helps the town accommodate traffic circulation and have roads built by the town, developers or the state," Graham said.

Board members gave favorable comment upon Slipp's plan and offered no suggestions or amendments.

Copies of the plan are on display at City Hall and are available for public viewing.

The final public hearing on this plan will be held at the town board's March 18 meeting.

The board also paid tribute to departing planning director Graham. Numerous gestures were extended Graham, who once again, was visibly moved by the sentiments expressed.

Graham has done a stellar job in his year's service here, board members said. He will move back to Florida to continue his planning career there. His wife has already moved there from her job in the City of High Point's planning department. The couple is expecting their first child this year.

Graham's successor has not yet been named. Town manager Joel Brower said he hopes such a decision can be made soon.

Graham is the second planning director to move on from Siler City to bigger things in the last two years. A year ago, Reggie Scales took a position in Martinsville, VA and later in Sanford, where he joined the staff of City Manager Leonard Barefoot. Scales served under Barefoot when the latter was Siler City town manager and took a similar position when Barefoot moved to the Sanford post.

Siler City, NC 27344 • Thursday, February 29, 1996

Chatham News/Record, Thursday, March 7, 1996 11-B

NOTICE OF PUBLIC HEARING

The Town of Siler City shall hold a Public Hearing on Monday, March 18, 1996, at 7:00 p.m. at the Siler City Town Hall, 311 North Second Avenue, Siler City, NC. The purpose of the public hearing will be to receive public comments in regard to the proposed Thoroughfare Plan. NCDOT staff will be present from 4:00 p.m. to 6:00 p.m. on this date to answer any questions.

Mr7-1tc

Chatham News/Record, Thursday, March 21, 1996 15-A

Town plans on streets, roads okayed

By Milburn Gibbs

What happens if they hold a meeting and no one comes?

That is exactly what happened Monday afternoon prior to the Siler City Town Board meeting.

Public apathy reached its zenith in Siler City when Peter Slipp of North Carolina Department of Transportation (NCDOT) held a two-hour public meeting concerning the proposed Thoroughfare Plan at the town hall.

Public meetings seem to attract all the no-shows recently, unless they are opposed to it. A meeting on the downtown historical district drew a similar response recently.

Slipp then presented his final

(See 'Town', Page 15-A)

Town

(Continued from Page A-1)

proposal to the town board at its regular meeting Monday.

"We (NCDOT and the Siler City Planning Board) have worked on this for three years," Slipp said.

The plan is necessary before any NCDOT funds can come to the town for work which the plan proposes.

Basically, the plan looks to the town's future transportation needs and tries to provide for them in anticipation of need. It is a plan for "orderly growth and development of the urban area."

The town board, with only Commissioner Pam Hobbs voting no, approved the plan.

The board also approved a rezoning request by Harold Hart concerning a tract of 0.34 acres from Residential-10 to Highway-Commercial (H-C). The site is located on North Fifth Avenue between Third Street and East Second Street.

Hart presently operates a fu ture factory on the adjacent prop ty and proposes to use this prope for parking and future growth Hart Furniture Company, Inc.

The board also approved an plication from Otis Martin to op ate an amusement business South Second Avenue, on propet formerly occupied by The Pantry.

The board unanimously approv Martin's application, which is goo for one year, and will be reviewe periodically thereafter.

An ordinance amending the Cap tal Projects Budget, Water Mai Project was also approved by th board.

The figure included both pric over-runs and under-runs.

Town Manager Joel Browe noted that 31 new water customer had been hooked up, which paid substantial portion of the cost of th project.

Siler City, NC 27344 • Thursday, March 28, 1996

In wide-ranging agenda . . .

Board talks on roads, jobs, leisure, airport

By Milburn Gibbs

An extra-large agenda awaited Siler City Town Board Commissioners Monday night.

Hobbs, Upchurch & Associates of Southern Pines was selected as Community Development Block Grant (CDBG) administrator for the Stonetech Development Grant Project.

Hobbs, Upchurch submitted the low bid of $14,000 to administer the grant, besting the bids of two other firms.

The town buys into half of the loan to Stonetech under the conditions of the grant. The budget ordinance, which was unanimously approved by commissioners, must be approved before the expenditure of any funds associated with the grant can be made.

"The monies are designated as a loan participation agreement for the Stonetech manufacturing facility," Town Manager Joel Brower wrote. "We are looking at the creation of about 25 jobs."

Peter Slipp, of North Carolina Department of Transportation (NCDOT), presented an updated Thoroughfare Plan to the board. Highlights of this plan include the new US 421 freeway; an "inner loop," which will "mesh transportation plans with land use plans," Slipp said; the Airport Road extension and "western circumferentials," a designation improvements of US 64 west of town will have.

The next step is a public meeting before the Thoroughfare Plan can be approved.

Slipp said that the Chatham County representative to NCDOT — Mary Hayes Holmes of Pittsboro — continued to do a wonderful job for Chatham, getting needed projects listed and approved.

Jordan-Matthews High School (J-M) math teacher Sandy Morse made a presentation of a plan to upgrade the image of the school.

The J-M School Improvement Team will attempt to make changes necessary to improve the school's said-to-be flagging image.

A report from Recreation Director Kenneth McPherson showed the extent of effort the Recreation Committee had made in researching the town's needs and suggested improvements. McPherson gave a reasoned account of priorities and proposals.

The board was receptive to his words and approved the recreational facilities priority planning.

Funding for the proposal will be considered in the Fiscal Year 1996-97 (FY 96-97) budget.

The board also approved a Recommendation Award for the 1995-96 Inflow and Infiltration Project.

Public Works Director Terry Green presented bids received, the low bid being from Columbus Utilities of Fairbluff, in the amount of $82,685.11. With inspection and engineering, the total cost of the project will be an even $100,000.

This is an on-going project and a regular budget item.

The State Airport Aid Project was also approved by all the commissioners still present at the exaggerated meeting.

A Resolution of Support to the Federal Communications Commissions (FCC) for classical radio station, WCPE-FM in Wake Forest, to increase its signal into Chatham County was approved by the board, with Commissioner Pem Hobbs voting against it.

And finally, the meeting was adjourned.

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